

Texaco Inc.

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ENSR

**Remedial Investigation/
Feasibility Study
Workplan for the
Texaco Facility
Fillmore, California**

**ENSR Consulting and Engineering
(Formerly ERT)**

September 29, 1989

Document Number 6600-023-130

**REMEDIAL INVESTIGATION/FEASIBILITY STUDY WORKPLAN
FOR THE TEXACO FILLMORE, CALIFORNIA FACILITY**

ENSR Document No. 6600-023-130

September 29, 1989

Prepared for

**TEXACO INC.
Research Environmental Affairs Department
Universal City, California**

**ENSR Consulting and Engineering
1220 Avenida Acaso
Camarillo, California 93010**



Formerly ERT

September 29, 1989

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Mike Montgomery T-4-2
EPA Region 9
Hazardous Waste Management Division
215 Fremont Street
San Francisco, CA 94105

Subject: Texaco Fillmore Facility RI/FS Workplan.

Dear Mr. Montgomery:

Enclosed please find two copies of the "Remedial Investigation/Feasibility Study Workplan for the Texaco Facility, Fillmore, California". We believe that the information contained in this document incorporates the suggestions you have provided.

Gordon Turl of Texaco Inc. has authorized ENSR to supply this information to the EPA Region 9.

Sincerely,

A handwritten signature in cursive script, reading 'Glenn R. Anderson'.

Glenn R. Anderson, RG
Senior Project Manager

GRA/dr

Reference No: 6600-023-100
ARS/1663/89

cc: Gordon Turl, Texaco Inc.
Terry Foreman, CH2M Hill

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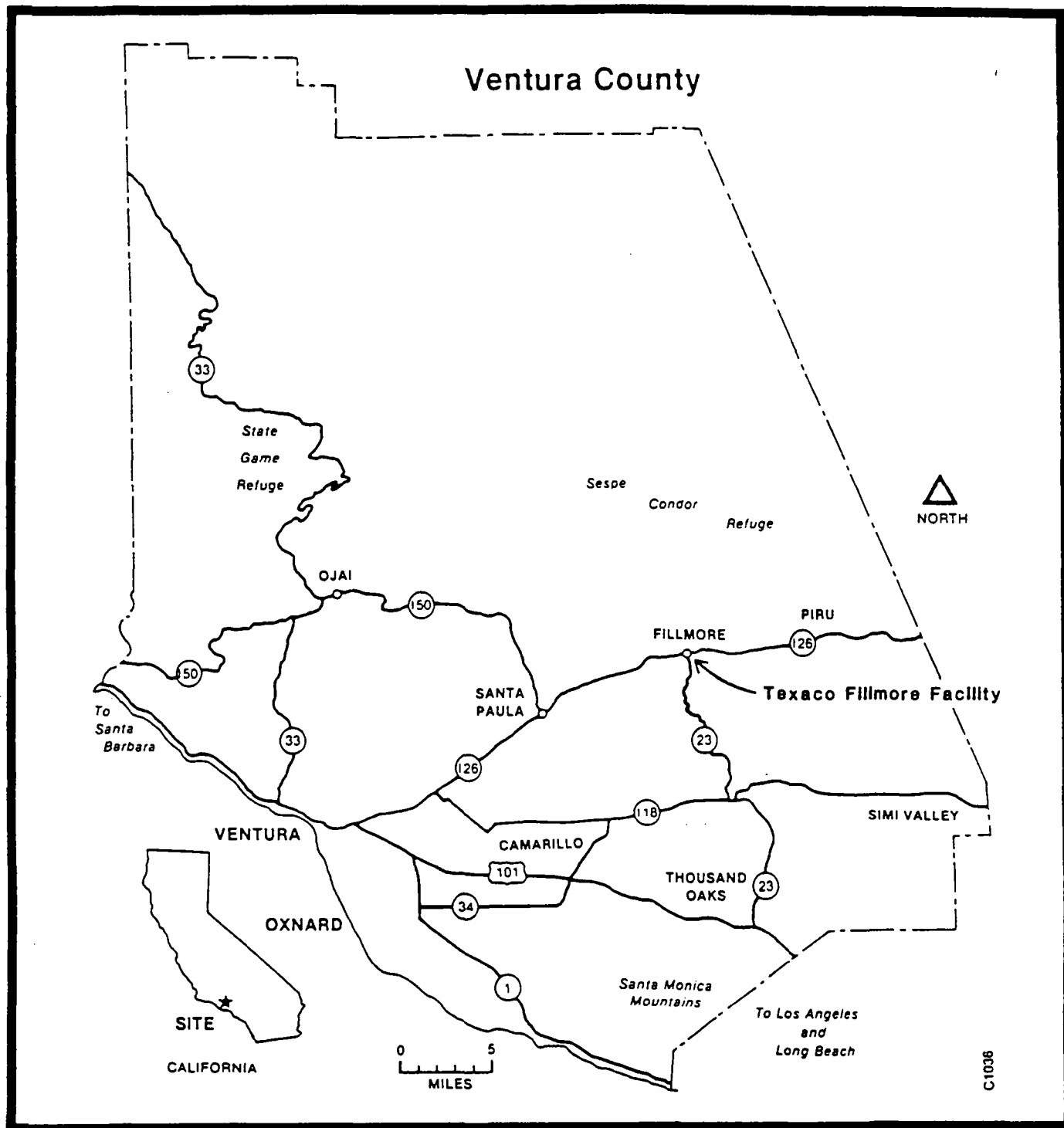
1. INTRODUCTION

The Texaco Fillmore facility, also previously known as the Pacific Coast Pipelines (PCPL) Site, is located at 67 East Telegraph Road in Ventura County east of the Pole Creek flood control channel and the incorporated area of the City of Fillmore, California (Figures 1-1 and 1-2). This site is currently proposed for the National Priorities List (NPL). This designation is being made by the U.S. Environmental Protection Agency (EPA) in accordance with the National Contingency Plan (NCP). The NCP serves as a basic policy directive for federal actions under CERCLA (Comprehensive Environmental Response, Compensation and Liability Act), more commonly known as Superfund.

As a potentially responsible party (PRP), Texaco has committed to conduct a remedial investigation to identify the site characteristics and define the nature and extent of soil and groundwater contamination at its Fillmore facility. Extensive investigations and contaminated soil excavation and redisposal have occurred under the direction of the California Department of Health Services (DHS) and Los Angeles Regional Water Quality Control Board (LARWQCB).

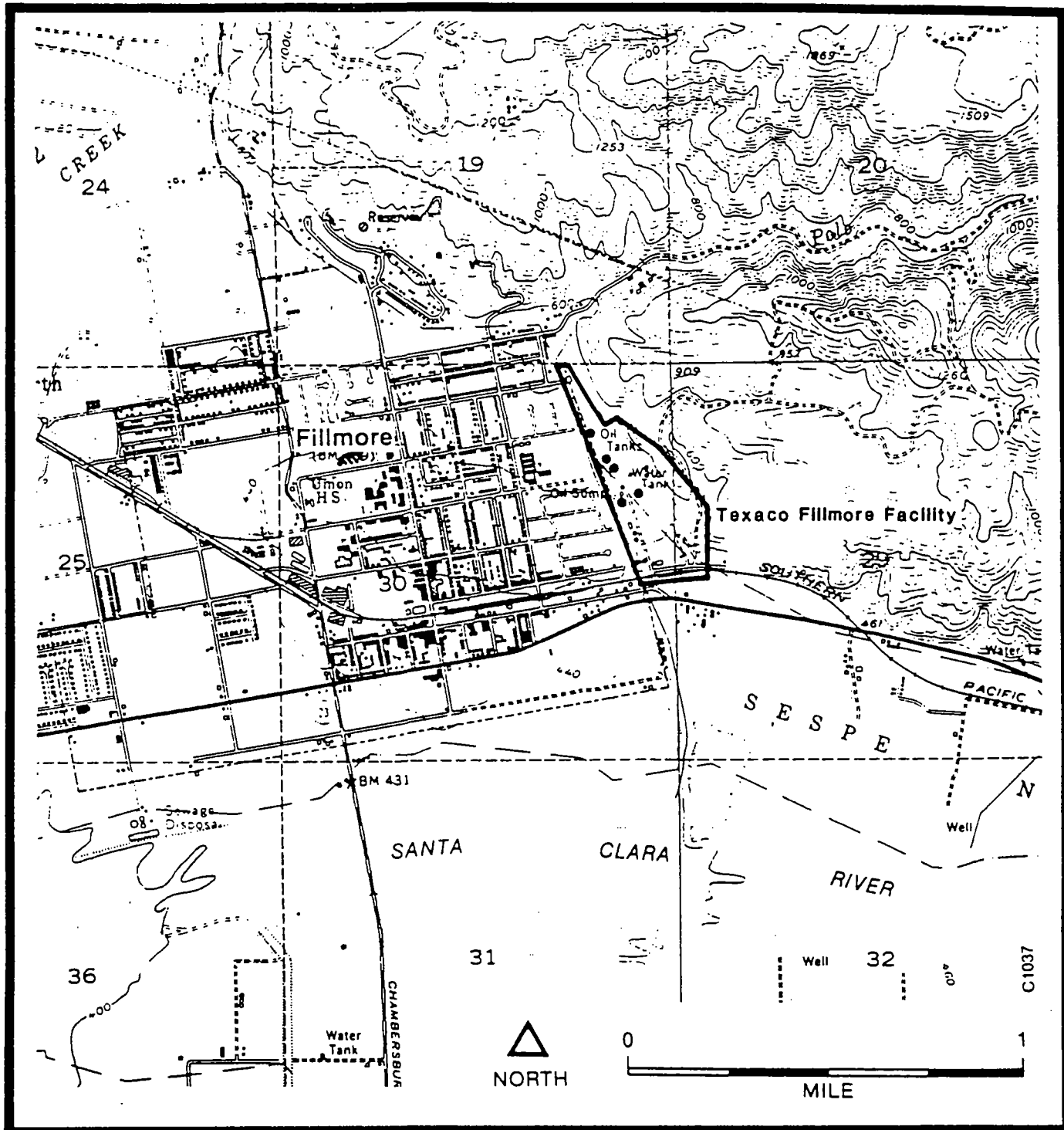
Pursuant to EPA guidance Texaco will also undertake a feasibility study to evaluate the alternative remedial actions which may be implemented to mitigate impacts caused by any remaining contamination from past Texaco Fillmore facility operations. Texaco will be attentive to adverse human health and/or environmental impacts attributable to Texaco site contaminants.

This Remedial Investigation/Feasibility Study (RI/FS) workplan has been prepared on behalf of Texaco Inc. - Research Environmental Affairs Department. The purpose of this RI/FS workplan is to describe the activities which will be undertaken to determine fully



ENSR Drawing No. 6600-023-100

Figure 1-1. Ventura County Site Location Map



ENSR Drawing No. 6600-023-100

Figure 1-2. City of Fillmore Site Location and Topographical Map.

the nature and extent of the remaining contamination and the potential for harm to the public health or welfare or the environment which may be caused by the release of any remaining hazardous contaminants at Texaco's Fillmore facility.

The primary objectives of the RI/FS for the site are to determine the need for source control and additional site remedial action(s), to control hazardous contaminants attributable to the Texaco site, and to recommend remedial action, if any, that is consistent with the NCP. Source control remedial actions may include, but are not limited to, measures to prevent, reduce, or eliminate contamination by remediation of hazardous wastes in place or removing them from the site. Offsite remedial actions, if necessary, may include, but are not limited to, measures to mitigate the effects of hazardous waste contamination that has migrated beyond the site. Appropriate source control and offsite remedial action(s), if needed, will be formulated and analyzed in detail after sufficient data have been reviewed and/or generated through the RI.

Based upon existing data, potentially feasible remedial actions appropriate for the Fillmore site may include, but are not limited to, one or a combination of the following:

- No action
- Removal and disposal of waste material
- Solidification or stabilization of waste material
- In-place reconstruction or encapsulation of waste material
- Continued offsite monitoring
- Limited access to contaminated areas
- Collection and treatment of groundwater
- Onsite treatment of contaminated soil
- Construction of a clay or synthetic cap over the landfill area(s)

- Construction of groundwater barriers
- Treatment methodologies and drinking-water-supply replacement.

In addition to the above, new technologies and advances in the state of the art that take place during the RI may provide alternative feasible remedial actions to be considered for the Fillmore site. Without completion of a phased RI, the present site information is insufficient to evaluate the need for a definitive selection, screening, and FS of the potentially feasible remedial action alternatives.

The scope of work in this workplan was prepared following an initial review of available data. A summary of results from previous investigations is included in the Initial Evaluation Section of this workplan. The prescribed work is subject to revision as the Site Background Summary is completed and as data are collected in the completion of successive tasks. The intent of this RI is to retain flexibility so that the workplan can be adjusted in accordance with professional judgment and technical need. Texaco will be responsible for conducting most of the RI/FS activities described in this workplan with oversight and/or technical input from the EPA. Texaco will inform the EPA of all field investigation work two weeks in advance so that EPA can participate in these investigations.

At certain points during the RI/FS, submissions will be made that require review and approval. All submissions will be reviewed and approved by the EPA.

Texaco will conduct the RI/FS in the series of tasks listed below:

- Task I: Project Planning Activities
- Task II: Field Activities
- Task III: Treatability Studies

- Task IV: Remedial Investigation Report
- Task V: Evaluation of Remedial Action (RA) Alternatives
- Task VI: Feasibility Study Report
- Task VII: Conceptual Design of RA Alternatives.

Task I activities are designed to assess the level of remaining contamination near the site and to identify potential receptors. After the data from Task I activities have been analyzed, the scope for further investigations will be determined in a review meeting between Texaco and EPA. Review of additional data following the completion of Task II field activities will further define the scope of any subsequent activities.

The scope of work for the RI/FS includes the following:

Remedial Investigation Deliverables

- **Task I - Project Planning Activities**

Continued Monitoring of Well Network
Site Background Summary

Historical Operations
Local Physiological Setting
Nature and Extent of Problem
Preliminary Site Boundary

Preliminary Identification of Potential State and Federal ARARs

Preliminary Identification of Remedial Action Technologies
Identification of the Need for Treatability Studies
Identification of Additional Data Needs

Sampling and Analysis Plan (SAP)

Health and Safety Plan (HSP)

Monthly Progress Reports

- **Task II - Field Activity Deliverables**

Hydrogeologic Investigation and Report

Subsurface Soil Investigation and Report

Soil Gas Investigation and Report

Surface Water and Stream Sediment Investigation and Report

Surface Soil Investigation and Report

Air Investigation and Report
Technical Memorandum - Completion of Field Support
Activities
Quarterly Groundwater Monitoring Reports

- Task III - Treatability Studies
- Task IV - Remedial Investigation Report

Feasibility Study Deliverables

- Task V - Evaluation of Remedial Action Alternatives
 - List of Potentially Feasible Remedial Technologies
 - Development and Screening of Remedial Technologies Report
 - Detailed Analysis of Alternatives Report
- Task VI - Feasibility Study Report
- Task VII - Conceptual Design
 - Preparation of Conceptual Design Elements
 - Conceptual Design Report

Project Schedule and Deliverables

Project Management

2. SITE BACKGROUND AND SETTING

The Texaco Fillmore facility is located at 67 East Telegraph Road in Ventura County east of the Pole Creek flood control channel and the incorporated area of the City of Fillmore, California (Figures 1-2 and 2-1). Texaco has been conducting groundwater and soils assessment programs and remediation activities at the Fillmore facility since 1983. The objectives of the assessment efforts for the Fillmore facility have included characterization of onsite disposal areas, evaluation of soil and groundwater quality, delineation of the lateral extent of hydrocarbon contamination, and evaluation of the onsite and offsite direction of groundwater flow. A comprehensive groundwater quality monitoring program is being conducted in cooperation with the Regional Water Quality Control Board (RWQCB). In addition to these assessment activities, Texaco conducted remedial operations including the excavation and removal of 33,000 cubic yards of waste and contaminated soil from the main waste pit and from several smaller waste disposal areas during January through September, 1986.

2.1 Historic Operations

The Fillmore facility was formerly the Texas Company Fillmore Refinery. The refinery was operated from approximately 1920 to 1950, at which time it was shut down and a majority of the refinery was dismantled. Texaco changed the use of the site to a crude oil pipeline pump station. Texaco presently continues to operate the Fillmore facility as a crude oil pipeline pump station.

Texaco has been conducting site assessment and remediation activities at the Fillmore facility since 1983. A main waste pit and several other refinery waste disposal areas consisting of unlined sumps and pits have been identified (Radian 1984). The

locations of these disposal areas are shown on Figure 2-1. While the refinery was in operation, miscellaneous refinery waste materials were placed on the refinery property in these disposal areas. In 1986, 33,000 cubic yards of waste materials and degraded soils in the main waste pit and several other disposal areas were excavated and transported to an offsite permitted disposal facility.

Potential sources of information concerning disposal practices, operating procedures, quantities of waste generated annually, and locations of all waste storage areas used at the site will be investigated. Information may be available locally from Texaco, museums, site personnel, and public records.

2.2 Local Physiographic Setting

2.2.1 Physical Setting

The Fillmore facility is located immediately east of the Pole Creek flood control channel and the incorporated area of the City of Fillmore, in Ventura County, California (Figures 1-1 and 1-2).

The subject site consists of approximately 20 acres situated northeast of the intersection of Highway 126 and Pole Creek. The site is surrounded by areas of mixed use. Situated adjacent to the subject site and to the north and east is vacant land with some agricultural use. Industrial and residential properties are located to the south, a gas station to the southwest, and residential homes and a secondary school along the western boundary of the subject site.

The site is located at elevations ranging from 480 to 625 feet above mean sea level in the foothills of the Topa Topa mountains. The site slopes generally to the south and west toward the Santa Clara River and is bordered on the west by Pole Creek, the only

natural surface-water drainage system in the immediate vicinity of the site.

Approximately 50 agricultural and municipal water wells are located within a 1-mile radius of the subject site and 17 within a 1/2-mile radius, the locations of which are illustrated on Figure 2-2.

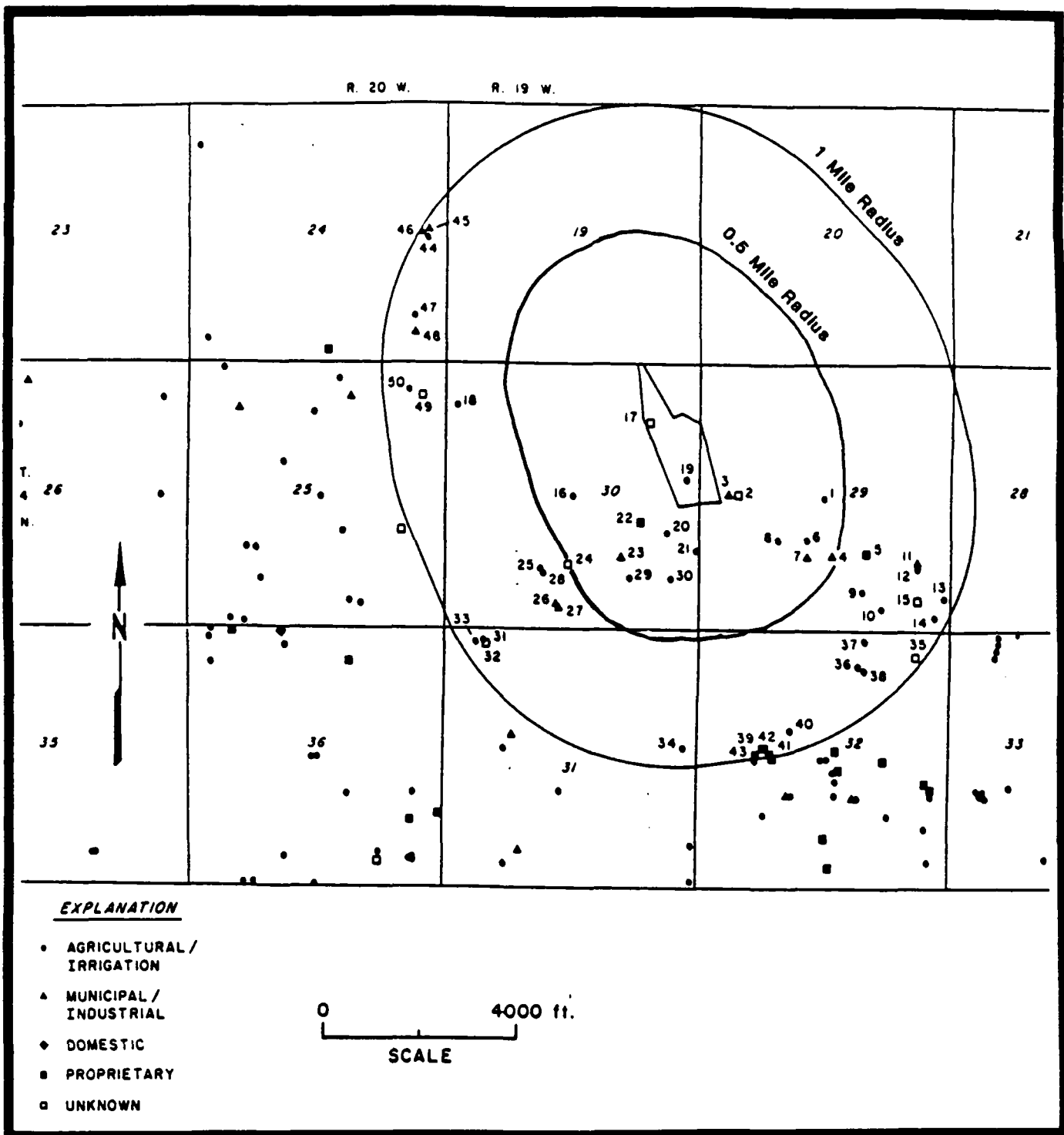
2.2.2 Hydrology

Regional groundwater flow data for the Santa Clara River Valley indicate that groundwater circulation in the vicinity of the Fillmore facility is toward the west.

A water table surface contour map produced with May 1989 water level data (Figure 2-3) illustrates the groundwater gradient beneath the Fillmore facility. The direction of flow is generally toward the northwest. The divergence of the local groundwater gradient from the regional gradient may be caused by the San Cayetana thrust fault which trends NW-SE along the eastern edge of the facility.

Groundwater gradients beneath the site steepen to the north. Groundwater gradients in the southern part of the facility are about 0.003 feet/foot. Hydraulic gradients in the central part of the facility range between 0.005 and 0.010 feet/foot, whereas hydraulic gradients in the northern part of the facility are about 0.015 feet/foot (TriHydro, October 1987).

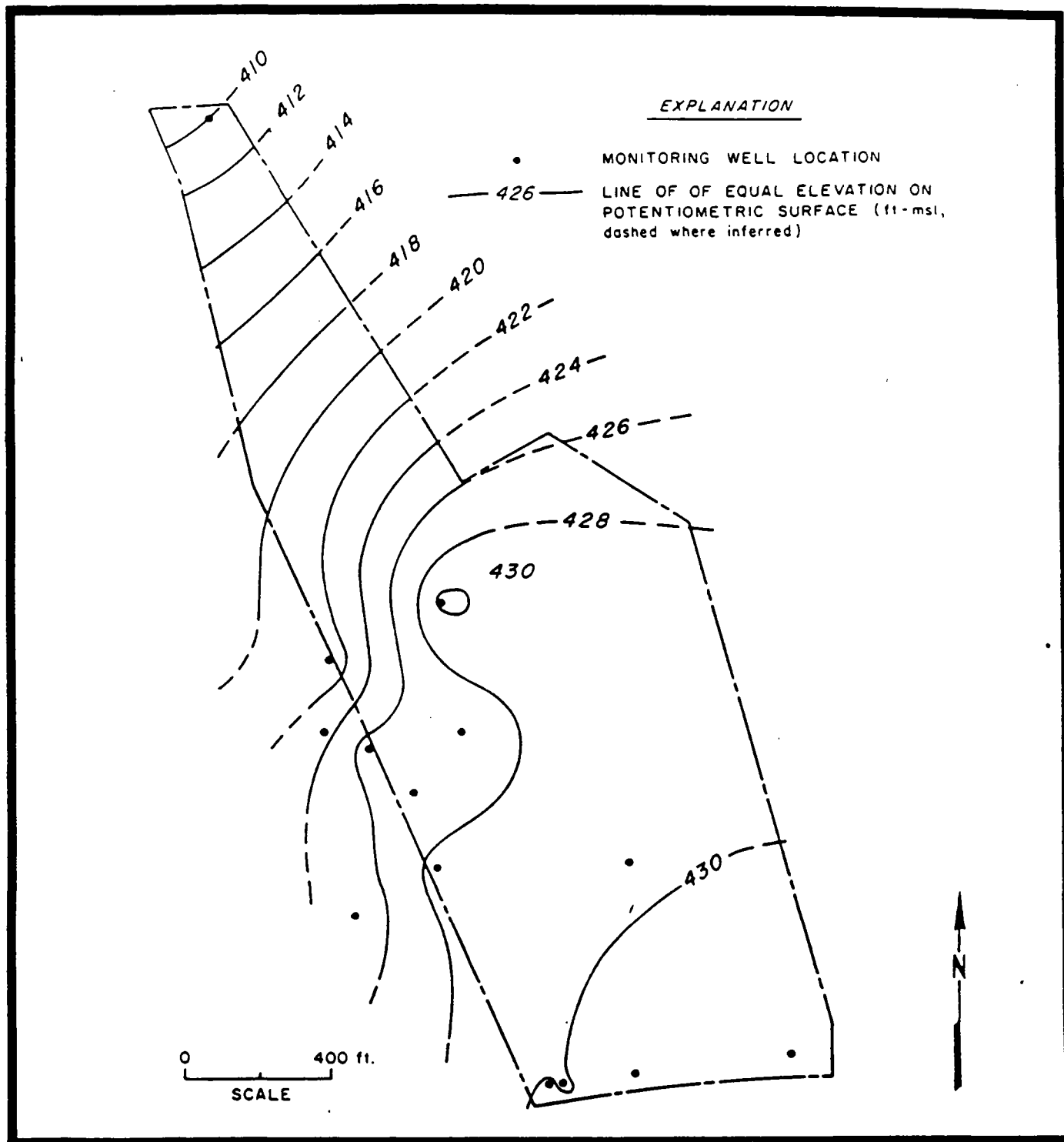
Groundwater of the principal water-bearing zone is approximately 50 feet below the surface in the southern part of the facility, increasing to the north to an approximate depth of 85 feet in the vicinity of the main waste pit and to a depth of 150 feet at the northernmost extent of the property.



Source: TriHydro 1988

ENSR Drawing No. 6600-023-130

Figure 2-2. Water Wells Located Near the Fillmore Facility



Source: TriHydro, July 1989

ENSR Drawing No. 6600-023-100

Figure 2-3. Water Table Surface Contour Map, Fillmore Facility (May 1989)

Perched groundwater has been encountered in four monitoring wells located south of the main waste pit: Wells MW-4, -10, -11, and -13. Depth of perched water in these wells ranges from 44 to 56 feet below the surface.

2.2.3 Geology

Subsurface geologic units of interest at the Fillmore site are the Quaternary terrace and colluvial deposits and the Late Eocene to Early Miocene Sespe Formation (Moore 1967).

The surface geology in the vicinity of the Fillmore facility consists primarily of Quaternary terrace and colluvial deposits which are generally less than 100 feet thick. Terrace deposits consist mainly of sand, gravel, boulders, and clay. Colluvial deposits consist of sand, silt, clay, gravel, and mudslides and mudflows. Colluvium rather than terrace deposits probably underlies the Fillmore facility.

The Sespe Formation is the uppermost bedrock geologic unit underlying the Fillmore site. This formation is divided into three areally extensive informal members consisting of coarse-grained upper and lower members and a poorly sorted fine to very fine middle member. These three informal members represent two geological periods of rapid sedimentation and uplift separated by a period of relative calm.

The Fillmore facility directly overlies the surficial plane of the San Cayetano thrust fault. The upper plate of the San Cayetano thrust is manifested in the abrupt topographic changes at the eastern edge of the facility (TriHydro 1987). According to Radian Corporation (1986), the fault dips to the north at angles ranging between 30 and 40 degrees.

2.3 Nature and Extent of Problem

2.3.1 Onsite Contamination

The actual and potential environmental effects of the remaining onsite contamination depend on the type and amount of landfilled waste remaining onsite, past surface spills and piping leaks, and offsite contamination migrating onsite.

Texaco determined the existence of hazardous substances onsite in 1982. These substances were related to the miscellaneous refinery wastes disposed of onsite in a large pit (approximate dimensions of 600' x 100') located on the western border of the property. In addition, wastes were also disposed of in eight identified smaller pits located throughout the facility (Figure 2-1). Such waste disposal practices were considered acceptable during the period of time the small refinery operated (1920 to 1950). Following the closure of the refinery in 1950, a majority of the facility was dismantled. Since closure of the refinery to the present time, the facility has operated only as a crude oil pumping station. It is believed that the waste disposal areas onsite have not been active since 1950.

The refinery waste material is believed to have consisted primarily of tank bottoms, filter clays, and sludge. The DHS determined that the refinery wastes and waste/soil mixtures present at the site are classified as hazardous wastes based on analyses of samples collected by DHS and data presented in Radian's RI/FS dated February 1984.

The waste material exhibited the following hazardous criteria (DHS, April 12, 1985):

- Corrosivity with a pH less than or equal to 2 [Section 66708, Title 22, California Administrative Code (CAC)].

- Total lead in concentrations exceeding 1,000 mg/kg (Section 66699, Title 22, CAC).
- Toxic concentrations of volatile organics and base-neutral, acid extractable organics, including but not limited to benzene, ethyl benzene, xylene, naphthalene, chrysene, and benzo-anthracene (Section 66680, Title 22, CAC and EPA Priority Pollutants).

Groundwater contamination has been detected in the general area of the main waste pit and at the southwestern corner of the facility. Elevated concentrations of phenols and VOCs [benzene, toluene, xylenes, and ethylbenzene (BTXE)] have been measured in groundwater samples from these two areas. Free-floating hydrocarbon has been observed intermittently in monitoring wells at the southwestern corner of the facility.

Soil boring programs were conducted in the main waste pit and southwestern areas of the facility to analyze soils for volatile and semivolatile organic compounds and to investigate the occurrence of a "red clay horizon."

The previous investigation results, which have not been validated, suggest that:

- All waste material appears to have been removed from the main waste pit.
- Some contamination is present beneath the main excavation pit.
- The near absence of benzene in soil samples from beneath the main waste pit, in contrast to the consistent presence of benzene in groundwater samples, indicates that the main waste pit is probably not the source of the area of groundwater quality degradation identified in the vicinity of the main waste pit.
- A large liquid hydrocarbon source appears responsible for a broad area of degraded soils and smaller areas of degraded groundwater in the southwestern portion of the facility, between the southwest corner of the facility and the main waste pit.

- The chemical composition of the soil contaminants beneath the main waste pit is somewhat different from that of the soils beneath the southwestern portion of the facility. In contrast to the soils beneath the main waste pit, which contain little or no benzene, ethylbenzene, and toluene, almost all of the soil samples collected south of the main waste pit contain significant concentrations of these VOCs. This finding supports the idea of more than one source of soil contamination.

Known health effects of the primary contaminants will be researched after a complete review of existing site data has been conducted and a Site Background Summary compiled. The primary contaminants are expected to include phenols and BTXE, and may include organolead, arsenic, barium, cadmium, and selenium.

2.3.2 Off Site Contamination

Known off site contamination in the area adjacent to the Texaco site has apparently resulted from both off site migration of degraded groundwater and off site sources.

Four groundwater monitoring wells have been installed by Texaco off of the site and generally down gradient from possible source areas (Figure 2-1). The latest sampling event for the wells detected benzene in MW-14 at 5.3 $\mu\text{g/L}$ (Tables 3-9 to 3-13).

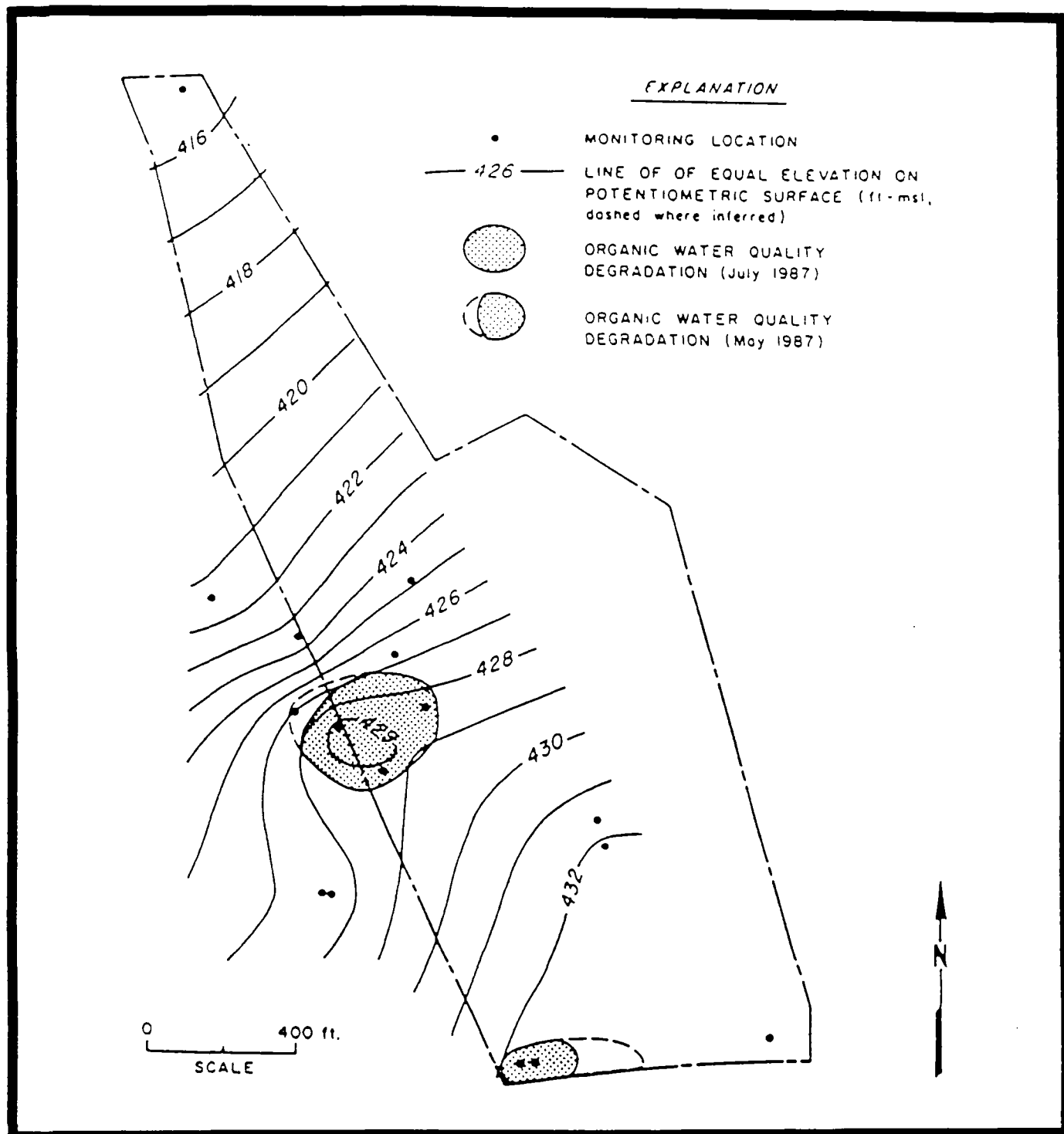
There is at least one documented off site source of soil and groundwater contamination adjacent to the Texaco site. Approximately 300 feet from the southwest corner of the property, a Fast Gas (Kayo Oil) gasoline station has reported a leak associated with an underground storage tank. Eight groundwater monitoring wells have been installed on the Fast Gas site.

2.4 Preliminary Site Boundary

Preliminary boundaries for the initial RI will be designated to address potential soil and groundwater impact.

The RI for the groundwater will emphasize two areas of degraded groundwater quality, one in the vicinity of the main waste pit, and the other near the southwestern corner of the site and will include a survey of wells within a radius of one-half mile of the site (Figures 2-2 and 2-4).

Assessment programs and remediation activities have been in effect at the subject site since 1983. The assessment programs have included studies of refinery waste impacts on adjacent properties located downgradient of the subject site. In 1988, TriHydro conducted a study titled "Environmental Assessment, Texaco Fillmore Facility and Adjacent Neighborhood Properties." No significant impacts to neighborhoods situated adjacent to and hydraulically downgradient from the site were identified.



SOURCE: TriHydro, 10/20/87

ENSR Drawing No. 6600-023-130

**Figure 2-4. Areas of Organic Groundwater Quality Degradation,
Fillmore Facility (May 1987 and July 1987)**

3. INITIAL EVALUATION - CONCEPTUAL SITE MODEL

Groundwater and soils assessment programs and remediation activities have been in effect at the Texaco Fillmore facility since 1983. An initial workplan and RI report was submitted to the RWQCB and the DHS on July 13, 1983. The scope of the workplan included the drilling of five shallow core holes through the main waste pit, installation of three groundwater monitoring wells, and the collection of shallow soil samples from eight other suspected waste pit areas. DHS approved the workplan in a letter dated July 25, 1983.

The initial pre-RI/FS investigation was completed by Radian Corporation in 1984. A main waste pit and eight other refinery waste disposal areas were identified. The locations of these disposal areas are shown on Figure 2-1. Texaco concluded that soils and groundwater beneath the main waste pit had been impacted by low levels of hydrocarbon contamination.

Texaco expanded the network of three monitoring wells and conducted further groundwater monitoring activities as part of a continued assessment effort with the objectives of evaluating groundwater quality, delineating the lateral extent of hydrocarbon contamination, and further evaluating the onsite and offsite direction of groundwater flow. Texaco also initiated a comprehensive groundwater quality monitoring program conducted in cooperation with the RWQCB.

Following these activities and after review of remedial options, Texaco voluntarily implemented remedial activities with the concurrence and lead oversight of DHS and under daily operating review of the Ventura County Environmental Health Department (VCEHD). The remedial activities included the excavation and removal of 33,000 cubic yards of waste and contaminated soil from

the main waste pit and from several smaller waste disposal areas during January through September 1986.

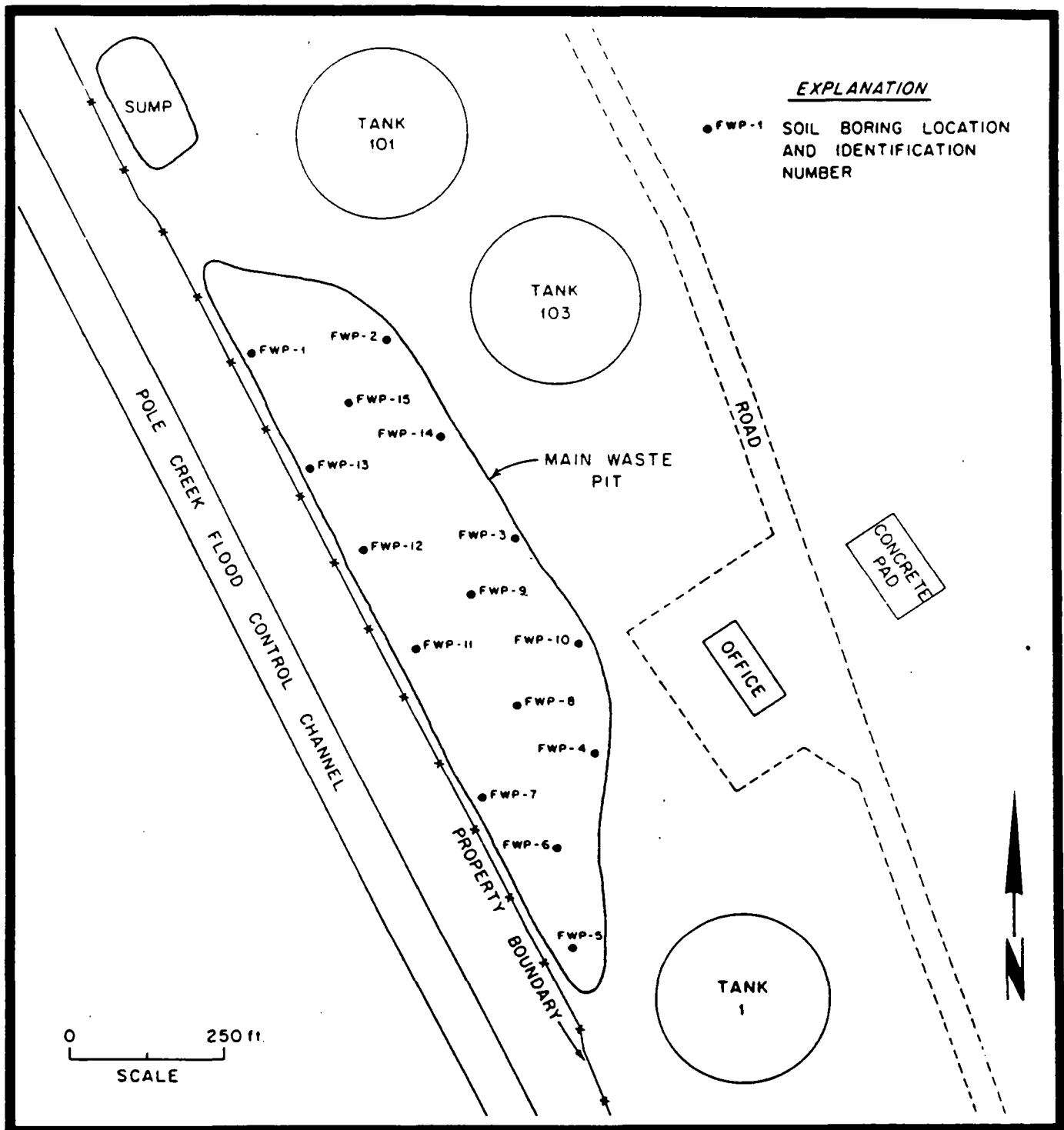
Concurrent with the waste remediation operations, Texaco conducted a soils boring program over the northern half of the main waste pit (Radian June 19, 1986). The results of the soil boring program were used as the basis for discontinuing the excavation of waste and soil from the main pit. This program characterized soil conditions beneath the pit. Volatile organic compounds (VOCs) (ethylbenzene and toluene) and semi-volatile compounds (phenols, naphthalene and phenanthrene) were detected in soils beneath the pit.

Additional investigative activities were conducted subsequent to detection of volatile and semi-volatile compounds beneath the main waste pit. These activities included the drilling of 15 boreholes over the main waste pit and 7 boreholes in the southwestern area of the facility; analysis of soils from each borehole; installation of four monitoring wells; and continued sampling and analysis of groundwater from all monitoring wells. The positions of the main waste pit and southwestern area boreholes are illustrated in Figures 3-1 and 3-2, respectively.

To date, 18 monitoring wells have been drilled at the Fillmore facility. The positions of these wells are best illustrated by reference to Figure 2-1. One well (MW-15) has been destroyed, one (MW-5) is dry and during the May 1989 sampling event six wells were found to intersect the potentiometric surface above the top of the screen intervals (MW-1, -4, -6, -7, -16, and P-2).

3.1 Types and Volumes of Waste Present

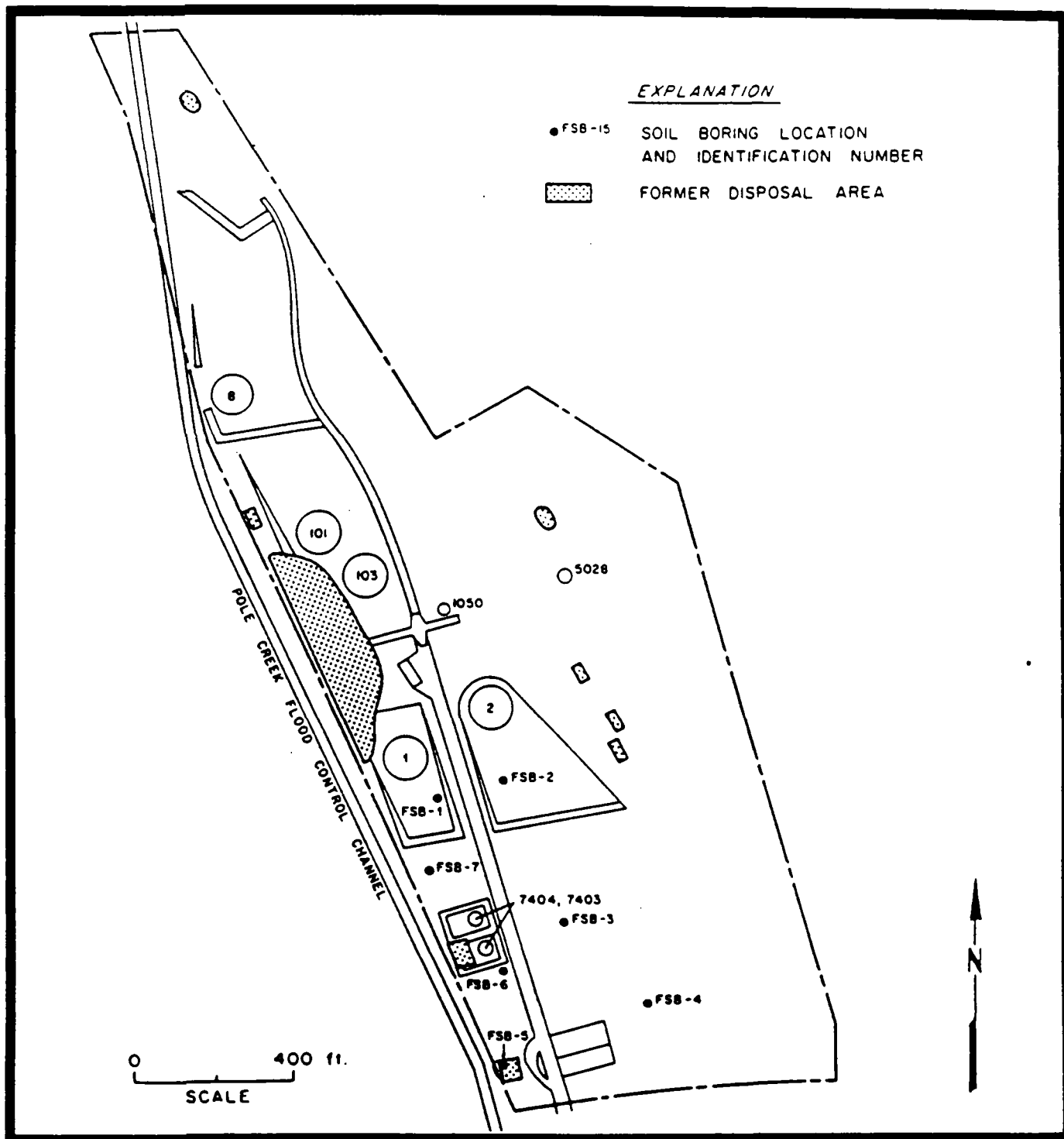
As part of Task I of the RI/FS investigation, Texaco will reinvestigate the possibility that other refinery waste disposal areas exist onsite. This investigation will consider sources



Source: TriHydro, June 1988

ENSR Drawing No. 6600-023-130

Figure 3-1. Soil Boring Locations, Main Waste Pit, Fillmore Facility (March 1988)



Source: TriHydro June 1988

ENSR Drawing No. 6600-023-100

Figure 3-2. Soil Boring Locations, Southwestern Area, Fillmore Facility (March 1988)

inclusive of old site blueprints, aerial photographs, and interviews with onsite refinery personnel. Areas of uncertainty will be considered as possible locations for collection of additional data.

3.1.1 Possible Waste Products From Refinery Operations

The Texaco Fillmore facility operated as the Texas Company Fillmore Refinery from approximately 1920 to 1950, at which time it was shut down and a majority of the refinery was dismantled. A number of potentially hazardous waste streams may have been generated by the petroleum refinery activities. These potential waste streams include:

- Slop oil and emulsion solids
- The following types of sludge; separator, heat exchange, bundle cleaning, wastewater treatment, once-through cooling water, cooling tower, chemical precipitation, acid
- Tank bottoms
- Stormwater runoff silt
- Spent filter clays
- Spent catalysts
- Spent clays
- Distillation bottoms
- Air flotation float

Metals of concern which may be present in the above listed waste products include arsenic, cadmium, total chromium, copper, lead, mercury, nickel, selenium, vanadium, and zinc.

Other contaminant sources which may impact the Texaco Fillmore site include leaking underground storage tank fuel from the gasoline station located adjacent to and south of the subject site and

petroleum-related compounds generated by oil-producing facilities located northeast of the subject site.

3.1.2 Hazardous Substances Known to be Present in the Main Waste Pit Material Previously Excavated

An environmental evaluation of the Pacific Coast Pipelines (PCPL) Facility investigated the chemical composition of the landfilled refinery waste material present onsite in unlined pits (Radian 1984). Analyses were conducted to determine the following waste and soil characteristics: pH, eight elements regulated for toxicity by RCRA (1984), and organics characterized by GC/MS analysis for priority pollutants. The lowest pH observed for the waste material was 1.5.

The eight RCRA elements included silver, arsenic, barium, cadmium, chromium, mercury, lead, and selenium, and were analyzed by EPA Methods 200.7, 206.3, 200.7, 200.7, 200.7, 245.1, 239.2, 270.3, respectively. The analyses indicated the following maximum concentrations for the respective compounds (Table 3-1).

3.1.3 Hazardous Substances Known to be Present in Soil and Groundwater at the Fillmore Facility

Texaco conducted soils boring programs over the main waste pit and the southwestern area of the facility to analyze soils for volatile and semi-volatile compounds and to investigate the occurrence of a "red clay horizon" (Radian June 19, 1986). VOCs (ethylbenzene and toluene) and semi-volatile compounds (phenols, naphthalene and phenanthrene) were detected in soils beneath the main waste pit. These compounds were also detected consistently in groundwater samples collected adjacent to the main pit. The source of the phenols, naphthalene and phenanthrene in the groundwater was linked to the refinery wastes that were removed from the pit. However, significant concentrations of benzene, not detected in soils below the main waste pit, were detected in groundwater both up- and

TABLE 3-1

**MAXIMUM RECORDED CONCENTRATIONS
OF HAZARDOUS SUBSTANCES
FOR EXCAVATED MAIN WASTE PIT MATERIAL**

<u>Compounds</u>	<u>Maximum Concentration (ppm)</u>
Arsenic (As)	19.0 ^a
Barium (Ba)	140.0 ^a
Cadmium (Cd)	11.0 ^a
Chromium (Cr)	120.0
Lead (Pb)	3,700.0 ^a
Mercury (Hg)	None detected
Selenium (Se)	1.2 ^a
Silver (Ag)	None detected
 Benzene	 9.3
Toluene	16.0
Ethylbenzene	10.0
 Alcohols ^b	 200.0
Ketones ^b	100.0
Aliphatic & Alicyclic Hydrocarbons ^b	450.0
Aromatic Hydrocarbons ^b	140.0
Alkene & Alkyne Hydrocarbons ^b	120.0

^a Values exceed the STLC listed in Section 66699 of the California Administration Code, Title 22.

^b Individual compounds combined and reported in their major hydrocarbon groups.

downgradient from the main pit. This suggests other potential sources of contamination besides the removed waste (TriHydro, June 1988). Results of laboratory analyses for soils from beneath the main waste pit and the southwestern area of the facility are listed in Tables 3-2 and 3-3, respectively.

To date, Texaco has installed 18 monitoring wells at and adjacent to the Fillmore facility. Groundwater degradation has been detected in the general area of the main waste pit and at the southwestern corner of the facility. Elevated concentrations of phenols and VOCs (BTXE) have been measured in groundwater samples from these two areas. Free-floating hydrocarbon has been observed intermittently in monitoring wells at the southwestern corner of the facility. Recent groundwater data reveal the following maximum concentrations for benzene (1.2 mg/L, MW-17, 5/23/89), phenols, ethylbenzene, toluene, and xylenes (0.07, 0.35, 0.31, and 0.53 mg/L respectively in P-2, 5/23/89).

TriHydro Corporation (June 1988) has concluded that the soil and groundwater investigations indicate:

- There appears to be a large liquid hydrocarbon source that is responsible for a broad area of degraded soils and smaller areas of degraded groundwater in the southwestern portion of the facility, between the southwest corner of the facility and the main waste pit. This area is characterized by elevated levels of VOCs in soils. Contamination generally begins at 20 to 30 feet below the surface and increases to a depth of the red clay marker bed. This red bed appears to be a semi-confining layer and a controlling mechanism for the accumulation and lateral migration of groundwater and hydrocarbon liquids. The areal extent of the degraded soils was not defined by the soils boring program. Near surface soil contamination identified in an area where explosive soil gas levels have been detected indicates the possibility of a shallow hydrocarbon source in this area (TriHydro, June 1988).
- Based on the soils analysis and on visual inspection, all of the waste material appears to have been removed from the main waste pit. Soils immediately below the level of excavation continue to be affected to varying degrees by hydrocarbon contaminants similar to those found by Radian in its June 1986

Table 3-2

Soil Quality Data, Main Waste Pit, Fillmore Facility

Constituent	Sample No.	FWP-1	FWP-2	FWP-3	FWP-4-1	FWP-4-2	FWP-6	FWP-7	FWP-8	FWP-9	FWP-10	FWP-11	FWP-12	FWP-13	FWP-14	FWP-15
Depth	5'	20'	20'	20'	20'	40'	20'	20'	20'	20'	20'	20'	20'	20'	20'	20'
(Concentrations in ppm)																
<u>Volatile (EPA 8020 + 8240)</u>																
Acetone	ND	ND	0.13	ND	ND	0.13	0.17	ND	ND	ND	ND	ND	ND	ND	ND	ND
Freon-TF	ND	0.43	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	ND	3.30	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	2.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.70
Ethylbenzene	18.0	ND	ND	ND	1.80	ND	ND	0.28	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	4.0	0.43	ND	ND	0.32	ND	ND	0.56	ND	ND	0.50	ND	ND	ND	ND	1.70
Total Xylenes	150.0	6.90	ND	0.93	2.70	ND	ND	2.7	1.20	1.80	1.80	0.006	1.80	2.70	16.0	16.0
C ₉ -C ₁₀ Alkylbenzenes	1000	200	0.030 ¹	ND	40	ND	ND	40	30	10	ND	40	10	200	400	600
Aliphatic & Alicyclic H.C.	3000	300	ND	200	400	ND	ND	60	200	1000	300	ND	90	400	600	600
All Others	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
<u>Semivolatiles (EPA 8270)</u>																
Chrysene	ND	ND	ND	0.67	0.06	ND	ND	1.10	ND	ND	ND	ND	ND	ND	1.10	ND
2,4-Dimethylphenol	7.10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Di-n-Butyl phthalate	ND	ND	ND	ND	ND	ND	ND	ND	1.30	ND	ND	ND	ND	ND	ND	ND
Fluorene	ND	ND	ND	ND	ND	ND	ND	0.59	ND	0.60	0.42	ND	ND	ND	0.95	0.45
2-Methylnaphthalene	1.90	ND	ND	ND	0.99	ND	ND	1.70	ND	ND	ND	ND	ND	ND	ND	ND
Naphthalene	2.30	0.96	ND	ND	3.40	ND	ND	2.60	ND	ND	ND	ND	ND	ND	ND	1.30
Phenanthrene	0.31	0.35	ND	0.78	0.15	ND	ND	2.10	0.39	3.2	1.3	ND	0.49	3.4	1.70	1.70
Pyrene	ND	ND	ND	0.46	0.05	ND	ND	0.69	ND	0.63	0.90	ND	ND	1.0	ND	ND
All Others	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
<u>BNA</u>																
1-Methylnaphthalene	1	ND	ND	ND	0.60	ND	ND	3.0	ND	ND	ND	ND	ND	ND	ND	ND
Dimethylnaphthalenes	3	ND	ND	ND	0.90	ND	ND	10	ND	ND	ND	ND	ND	ND	ND	ND
Sulfur	ND	ND	ND	ND	400	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hydrocarbon Matrix	1000	10000	20	6000	1000	60	ND	3000	9000	10000	10000	70	8000	20000	8000	8000
All Others	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

¹ Identified by the laboratory as propylbenzene

Source: TriHydro, June 1988

Table 3-3

Soil Quality Data, Southwestern Area, Fillmore Facility

		Soil Boring Number							
Constituent	Sample No.	FSB-1	FSB-2	FSB-3	FSB-4	FSB-5	FSB-5D	FSB-6	FSB-7
	Depth	19'	36'	34'	30'	29'	49'	31'	30'
(Concentrations in ppm)									
Benzene		0.005	ND	ND	3.9	94	0.020	0.056	0.026
Toluene		0.012	3.3	2.3	ND	140	0.016	0.073	0.035
Ethylbenzene		0.0025	14	6.1	12	130	0.014	0.018	0.007
Total Xylenes		0.0097	21	6.0	13	580	0.037	0.058	0.042
Naphthalene		0.007	140	36	22	710	0.240	0.063	0.160
Total Petroleum Hydrocarbons		41	9500	2700	4100	84000	58	74	150
All Others		ND	ND	ND	ND	ND	ND	ND	ND

Source: TriHydro, June 1988

soil/waste coring investigation. The maximum depth of the soil contamination has not been determined; however, there are relatively clean soils at 20 feet beneath some areas of the waste pit. This indicates that the main waste pit is probably not responsible for the large area of degraded soils identified in the southwest portion of the facility (TriHydro, June 1988).

- The near absence of benzene in soil samples from beneath the main waste pit, in contrast to the consistent presence of benzene in groundwater samples, indicates that the main waste pit is probably not the source of the area of groundwater quality degradation identified in the vicinity of the main waste pit (TriHydro, June 1988).
- The chemical composition of the soil contaminants beneath the main waste pit is somewhat different from that of the soils beneath the southwestern portion of the facility. In contrast to the soils beneath the main waste pit, which contain little or no benzene, ethylbenzene, and toluene, almost all of the soil samples collected south of the main waste pit contain significant concentrations of these VOCs. This finding supports the idea of more than one source of soil contamination (TriHydro, June 1988).

Inorganic and organic groundwater quality analysis results for the monitoring period May 1987 through May 1989 are listed in Tables 3-4 through 3-13.

3.2 Potential Pathways of Contaminant Migration

More than one contaminant source may impact the Fillmore site. Sources of environmental contamination may include unlined waste disposal pits, aboveground storage tanks, surface fuel spills, leaking underground pipes, and upgradient offsite sources including underground fuel storage tanks and oil production facilities. Release mechanisms associated with these sources may include both surface migration and percolation to subsurface soils. Secondary release mechanisms may include volatile air emissions, percolation to underlying soil and groundwater, and stormwater runoff. These potential release mechanisms may result in exposure pathways of ingestion, inhalation, and dermal contact.

Table 3-4

Inorganic Groundwater Quality Data, Texaco's Fillmore Pipeline Facility, Fillmore, California (May 1987 - May 1989)

Well and Date Sampled	Field Measurements			Lead			Total Dissolved Solids (mg/L)
	pH (std. units)	Temp. (°C)	Specific Conductance (µmhos/cm @ 25°C)	Total (mg/L)	Dissolved (mg/L)	Organic (mg/L)	
MW-1							
5-21-87	7.7	22.7	1350	0.02	--	--	959
MW-2							
5-20-87	7.2	20.2	1290	<0.1	--	--	704
7-29-87	7.3	21.1	1220	<0.01	<0.01	--	--
9-22-87	7.4	21.8	1280	<0.01	--	--	--
12-02-87	7.3	20.4	1630	<0.01	--	--	--
2-16-88	7.1	22.3	1160	<0.01	--	--	--
5-17-88	7.4	20.7	1290	--	--	--	--
8-24-88	7.3	21.0	1260	--	--	--	--
11-15-88	7.5	18.6	1380	--	--	--	--
2-21-89	7.3	22.3	1510	--	--	--	--
5-22-89	7.3	21.0	1228	--	--	--	--
MW-3							
5-21-87	8.5	22.6	1210	0.03	--	--	638
7-30-87	7.4	23.5	1330	<0.01	<0.01	--	--
9-23-87	7.3	21.0	1450	<0.01	--	--	--
12-02-87	7.4	19.6	1360	<0.01	--	--	--
2-16-88	7.2	21.2	1160	<0.01	--	--	--
5-18-88	7.4	22.5	1260	--	--	--	--
8-24-88	7.3	21.2	1300	--	--	--	--
11-16-88	8.3	21.0	1480	--	--	--	--
2-22-89	7.3	23.7	1440	--	--	--	--
5-23-89	7.4	21.5	1634	--	--	--	--
MW-4							
5-21-87	7.4	21.2	1940	0.41	--	<0.1	1416
7-30-87	7.5	20.8	1960	0.01	0.01	--	--
9-23-87	7.0	19.8	1930	0.014	--	--	--
12-02-87	7.4	20.2	2190	<0.01	--	--	--
2-15-88	7.2	19.9	1950	0.028	--	--	--
5-17-88	7.4	20.6	2000	--	--	--	--
8-23-88	7.3	21.6	2060	--	--	--	--
11-15-88	7.4	18.1	2080	--	--	--	--
2-21-89	7.3	20.0	2220	--	--	--	--
5-22-89	7.3	21.6	1964	--	--	--	--

Source: TriHydro, July 1989

Table 3-5

Inorganic Groundwater Quality Data, Texaco's Fillmore Pipeline Facility, Fillmore, California (May 1987 - May 1989)

Well and Date Sampled	Field Measurements			Lead			Total Dissolved Solids (mg/L)
	pH (std. units)	Temp. (°C)	Specific Conductance (µmhos/cm @ 25°C)	Total (mg/L)	Dissolved (mg/L)	Organic (mg/L)	
MW-5							
5-21-87	7.2	19.2	2300	0.64	--	<0.1	1679
7-30-87	7.1	21.3	2260	0.40	0.02	--	--
MW-6							
5-20-87	8.6	20.4	1070	<0.10	--	--	621
7-29-87	7.6	21.0	1130	0.01	0.01	--	--
9-22-87	7.4	22.0	1150	<0.01	--	--	--
12-02-87	7.5	20.3	1100	<0.01	--	--	--
2-16-88	7.4	22.0	1180	<0.01	--	--	--
5-17-88	7.5	20.2	1130	--	--	--	--
8-24-88	7.6	21.3	1090	--	--	--	--
11-16-88	7.3	21.1	1060	--	--	--	--
2-22-89	7.6	21.3	1090	--	--	--	--
5-22-89	7.7	21.6	1062	--	--	--	--
MW-7							
5-21-87	7.1	21.8	2810	0.27	--	<0.1	1654
7-29-87	7.0	21.7	2840	0.01	0.01	--	--
9-22-87	7.0	22.4	2710	<0.01	--	--	--
12-01-87	7.2	19.0	2690	<0.01	--	--	--
2-16-88	7.0	21.1	2670	<0.01	--	--	--
5-17-88	7.1	20.6	2480	--	--	--	--
8-24-88	7.1	21.9	2280	--	--	--	--
11-16-88	7.1	21.0	2200	--	--	--	--
2-22-89	7.1	22.2	2320	--	--	--	--
5-23-89	7.0	21.6	2124	--	--	--	--
MW-8							
5-19-87	6.8	21.7	2570	<0.1	--	--	1471
7-29-87	7.1	21.5	2120	<0.01	<0.01	--	--
9-22-87	7.0	21.8	1990	<0.01	--	--	--
12-01-87	7.2	19.7	2180	<0.01	--	--	--
2-16-88	6.9	20.8	2180	<0.01	--	--	--
5-17-88	7.1	20.3	2300	--	--	--	--
8-24-88	7.1	21.3	2240	--	--	--	--
11-16-88	7.0	20.6	2260	--	--	--	--
2-21-89	7.2	20.1	2090	--	--	--	--
5-23-89	7.3	21.9	1674	--	--	--	--

Source: TriHydro, July 1989

Table 3-6

Inorganic Groundwater Quality Data, Texaco's Fillmore Pipeline Facility, Fillmore, California (May 1987 - May 1989)

Well and Date Sampled	Field Measurements			Lead			Total Dissolved Solids (mg/L)
	pH (std. units)	Temp. (°C)	Specific Conductance (µmhos/cm @ 25°C)	Total (mg/L)	Dissolved (mg/L)	Organic (mg/L)	
MW-9							
5-19-87	7.5	20.3	1290	<0.1	--	--	744
7-30-87	7.0	23.2	1270	0.03	<0.01	--	--
9-22-87	6.7	22.1	1990	<0.01	--	--	--
12-02-87	7.4	20.9	1850	<0.01	--	--	--
2-16-88	7.1	20.7	1810	<0.01	--	--	--
5-17-88	6.7	19.3	1330	--	--	--	--
8-24-88	7.6	21.1	1320	--	--	--	--
11-16-88	6.9	20.3	2000	--	--	--	--
2-22-89	7.3	21.1	1360	--	--	--	--
5-23-89	7.0	21.9	1631	--	--	--	--
MW-10							
5-20-87	6.8	20.1	2000	<0.1	--	--	1264
MW-11							
5-19-87	7.0	18.2	1710	0.03	--	--	1267
MW-12							
5-20-87	7.1	19.1	1460	0.02	--	--	972
7-30-87	7.3	21.8	1580	0.01	0.01	--	--
9-22-87	7.1	19.7	1620	0.017	--	--	--
12-02-87	7.3	18.2	1590	<0.01	--	--	--
2-15-88	7.6	19.3	1670	0.013	--	--	--
5-18-88	7.3	20.7	1660	--	--	--	--
8-23-88	7.3	20.7	1690	--	--	--	--
11-15-88	6.8	19.5	1630	--	--	--	--
2-21-89	7.2	22.7	1760	--	--	--	--
5-22-89	7.4	21.7	1585	--	--	--	--
MW-13							
5-21-87	7.6	18.7	1720	0.01	--	--	960
7-30-87	7.6	21.3	1740	0.01	0.01	--	--
MW-14							
5-20-87	7.4	19.4	1410	0.01	--	--	783
7-31-87	7.3	24.1	1490	0.02	0.01	--	--
9-22-87	7.1	21.4	1440	0.011	--	--	--
12-03-87	7.6	20.5	1550	<0.01	--	--	--
2-15-88	7.1	21.0	1500	<0.01	--	--	--

3-14

Table 3-7

Inorganic Groundwater Quality Data, Texaco's Fillmore Pipeline Facility, Fillmore, California (May 1987 - May 1989)

Well and Date Sampled	Field Measurements			Lead			Total Dissolved Solids (mg/L)
	pH (std. units)	Temp. (°C)	Specific Conductance (µmhos/cm @ 25°C)	Total (mg/L)	Dissolved (mg/L)	Organic (mg/L)	
MW-14 (continued)							
5-17-88	7.2	21.5	1360	--	--	--	--
8-23-88	7.2	21.8	1350	--	--	--	--
11-15-88	7.5	17.6	1640	--	--	--	--
2-21-89	7.5	20.4	1780	--	--	--	--
5-22-89	7.4	21.1	1659	--	--	--	--
MW-15							
5-20-87	7.3	19.2	1230	0.02	--	--	800
7-31-87	7.3	22.9	1220	0.01	0.01	--	--
9-22-87	7.1	21.1	1290	0.013	--	--	--
12-01-87	7.4	19.4	1220	<0.01	--	--	--
2-15-88	7.2	20.8	1190	<0.01	--	--	--
5-17-88	7.5	20.9	1170	--	--	--	--
8-23-88	7.4	21.9	1130	--	--	--	--
11-15-88	7.3	19.6	1120	--	--	--	--
*	*	*	*	*	*	*	*
MW-16							
2-17-88	7.0	18.2	1830	0.022	--	--	--
5-17-88	7.0	20.1	1810	--	--	--	--
8-24-88	6.7	21.5	1930	--	--	--	--
11-15-88	6.9	18.9	1800	--	--	--	--
2-21-89	7.4	20.5	1960	--	--	--	--
5-22-89	7.2	20.6	1754	--	--	--	--
MW-17							
2-16-88	7.2	20.2	1500	<0.01	--	--	--
5-17-88	7.2	19.7	1670	--	--	--	--
8-24-88	7.1	22.1	1860	--	--	--	--
11-16-88	7.0	21.4	2130	--	--	--	--
2-22-89	7.0	23.9	1440	--	--	--	--
5-23-89	7.2	21.4	1756	--	--	--	--
P-2							
5-21-87	7.1	20.7	1180	0.13	--	--	639
7-30-87	7.2	23.7	1170	0.25	<0.01	--	--
9-23-87	7.2	20.9	1280	<0.01	--	--	--
12-03-87	7.2	19.7	1160	0.02	--	--	--
2-16-88	7.0	21.3	1120	<0.01	--	--	--

3-15

Source: TriHydro, July 1989

Table 3-8

Inorganic Groundwater Quality Data, Texaco's Fillmore Pipeline Facility, Fillmore, California (May 1987 - May 1989)

Well and Date Sampled	Field Measurements			Lead			Total Dissolved Solids (mg/L)
	pH (std. units)	Temp. (°C)	Specific Conductance (µmhos/cm @ 25°C)	Total (mg/L)	Dissolved (mg/L)	Organic (mg/L)	
P-2 (continued)							
5-18-88	7.4	20.7	1190	..	..	..	..
8-24-88	7.1	21.6	2150	..	..	..	..
11-16-88	7.2	20.6	1120	..	..	..	..
2-22-89	7.3	22.4	1160	..	..	..	..
5-23-89	7.3	21.1	1095	..	..	..	..

* Well MW-15 was vandalized. No samples were obtainable from this well.

Source: TriHydro, July 1989

Table 3-9

Organic Groundwater Quality Data, Texaco's Fillmore Pipeline Facility, Fillmore, California (May 1987 - May 1989)

Well and Date Sampled	Volatile Organics					
	Phenols (mg/L)	Benzene (mg/L)	Ethylbenzene (mg/L)	Toluene (mg/L)	Xylene (mg/L)	All Others (mg/L)
MW-1						
5-21-87	<0.05	0.0049	0.001	0.0044	0.003	--
MW-2						
5-20-87	<0.05	0.651	0.062	0.102	0.057	--
7-29-87	--	1.660	0.030	0.118	0.050	--
9-22-87	0.038	0.037	0.074	0.153	0.020	--
12-02-87	0.043	0.120	0.006	0.002	0.003	--
2-16-88	0.043	0.926	0.185	0.107	0.974	--
5-17-88	0.01	0.240	0.010	0.014	<0.010	--
8-24-88	0.05	1.000	0.045	0.070	0.030	--
11-15-88	0.02	0.240	<0.005	<0.025	<0.025	--
2-21-89	0.03	0.038	<0.005	0.005	0.005	--
5-22-89	0.02	0.210	<0.005	0.011	0.005	--
MW-3						
5-21-87	<0.05	0.139	<0.0001	0.011	<0.0001	--
7-30-87	--	0.106	0.0010	0.009	0.004	--
9-23-87	0.010	0.103	0.021	0.019	0.044	--
12-02-87	<0.005	0.026	0.010	0.025	0.012	--
2-16-88	0.007	0.326	<0.001	0.196	<0.001	--
5-17-88	0.04	0.140	0.005	0.019	<0.010	--
8-24-88	0.02	0.160	<0.020	0.032	<0.020	--
11-16-88	0.03	0.170	<0.025	<0.025	<0.025	--
2-22-89	0.02	0.150	<0.005	0.019	<0.005	--
5-23-89	0.04	0.089	<0.005	0.013	<0.005	--
MW-4						
5-21-87	<0.05	0.0007	<0.0001	0.0004	0.001	--
7-30-87	--	<0.0005	<0.0005	<0.0005	<0.0005	--
9-23-87	0.009	<0.001	0.007	<0.001	0.005	--
12-01-87	<0.005	<0.001	0.008	0.008	<0.001	--
2-15-88	<0.005	0.004	<0.001	<0.001	<0.001	--
5-17-88	<0.01	<0.005	0.005	0.006	<0.001	--
8-23-88	0.04	<0.001	<0.001	<0.001	<0.001	--
11-15-88	<0.01	<0.005	<0.005	<0.005	<0.005	--
2-21-89	<0.01	<0.005	<0.005	<0.005	<0.005	--
5-22-89	<0.01	<0.005	<0.005	<0.005	<0.005	--

Source: TriHydro, July 1989

Table 3-10

Organic Groundwater Quality Data, Texaco's Fillmore Pipeline Facility, Fillmore, California (May 1987 - May 1989)

Well and Date Sampled	Volatile Organics					
	Phenols (mg/L)	Benzene (mg/L)	Ethylbenzene (mg/L)	Toluene (mg/L)	Xylene (mg/L)	All Others (mg/L)
MW-5						
5-21-87	<0.05	0.0007	0.0001	0.0002	0.0003	--
7-30-87	--	<0.0005	<0.0005	<0.0005	<0.0005	--
MW-6						
5-20-87	<0.05	0.0039	<0.0001	<0.0001	0.006	--
7-29-87	--	<0.0005	<0.0005	<0.0005	<0.0005	--
9-22-87	0.023	0.003	0.055	0.018	0.072	--
12-02-87	<0.005	0.024	0.025	0.008	0.005	--
2-16-88	0.006	<0.001	<0.001	<0.001	<0.001	--
5-17-88	0.01	0.240	0.011	0.010	<0.01	--
8-24-88	0.02	0.78	<0.001	0.0023	<0.001	--
11-16-88	0.03	0.420	<0.025	<0.025	<0.025	--
2-22-89	<0.01	0.410	<0.010	0.017	<0.010	--
5-22-89	0.01	0.660	<0.010	0.021	<0.010	--
MW-7						
5-21-87	<0.05	0.277	0.287	0.585	<0.0001	--
7-29-87	--	0.348	0.136	0.019	0.056	--
9-22-87	0.035	0.013	0.002	<0.001	<0.001	--
12-01-87	0.042	0.005	0.014	0.015	0.023	--
2-16-88	0.034	<0.001	<0.001	<0.001	0.016	--
5-17-88	0.07	0.270	<0.020	0.095	0.045	--
8-24-88	0.06	0.11	<0.001	0.036	0.011	--
11-16-88	0.07	0.260	<0.025	<0.025	<0.025	--
2-22-89	0.05	0.290	<0.010	0.093	0.034	--
5-23-89	0.06	0.290	0.007	0.075	0.016	--
MW-8						
5-19-87	<0.05	0.288	0.041	0.106	0.077	--
7-29-87	--	0.439	0.194	0.029	0.013	--
9-22-87	0.027	0.349	0.075	0.158	0.144	--
12-01-87	0.049	0.274	1.66	0.200	0.717	--
2-16-88	0.043	<0.001	<0.001	<0.001	<0.001	--
5-17-88	0.07	0.260	<0.020	0.074	<0.040	--
8-24-88	0.06	0.250	0.0062	0.081	0.038	--
11-16-88	0.07	0.200	<0.025	<0.025	<0.025	--
2-21-89	0.04	0.330	<0.010	0.097	0.044	--
5-23-89	0.06	0.340	<0.005	0.085	0.053	--

Source: TriHydro, July 1989

Table 3-11

Organic Groundwater Quality Data, Texaco's Fillmore Pipeline Facility, Fillmore, California (May 1987 - May 1989)

Well and Date Sampled	Volatile Organics					All Others (mg/L)
	Phenols (mg/L)	Benzene (mg/L)	Ethylbenzene (mg/L)	Toluene (mg/L)	Xylene (mg/L)	
MW-9						
5-19-87	<0.05	0.080	0.036	0.072	0.058	--
7-30-87	--	<0.0005	<0.0005	<0.0005	<0.0005	--
9-22-87	0.012	0.018	0.036	0.045	0.069	--
12-02-87	0.015	0.028	0.142	0.078	0.220	--
2-16-88	0.025	0.066	<0.001	<0.001	<0.001	--
5-17-88	<0.01	0.019	<0.005	0.011	0.012	--
8-24-88	<0.01	0.015	0.0023	0.0084	0.0093	--
11-16-88	0.04	0.016	<0.005	0.0081	<0.005	--
2-22-89	0.02	0.016	<0.005	0.012	0.012	--
5-23-89	0.03	0.015	<0.005	0.009	0.010	--
MW-10						
5-20-87	<0.05	0.0037	<0.0001	0.017	<0.0001	--
MW-11						
5-19-87	<0.05	0.0007	<0.0001	0.0008	0.006	--
MW-12						
5-20-87	<0.05	0.0005	<0.0001	<0.0001	0.001	--
7-30-87	--	<0.0005	<0.0005	<0.0005	<0.0005	--
9-22-87	<0.005	0.006	<0.001	0.007	<0.001	--
12-02-87	<0.005	<0.001	<0.001	<0.001	<0.001	--
2-16-88	0.008	0.002	<0.001	0.002	<0.001	--
5-18-88	<0.01	<0.0005	<0.0005	<0.0005	<0.001	--
8-23-88	<0.01	<0.001	<0.001	<0.001	<0.001	--
11-15-88	<0.02	<0.005	<0.005	<0.005	<0.005	--
2-21-89	<0.01	<0.005	0.0098	0.020	0.083	--
5-22-89	<0.01	<0.005	<0.005	<0.005	<0.005	--
MW-13						
5-21-87	<0.05	<0.0001	0.0087	0.0087	0.006	--
7-30-87	--	<0.0005	<0.0005	<0.0005	<0.0005	--
MW-14						
5-20-87	<0.05	0.227	0.014	0.020	0.041	--
7-31-87	--	<0.0005	<0.0005	<0.0005	<0.0005	--
9-23-87	<0.005	0.004	<0.001	0.024	<0.001	--
12-03-87	<0.005	0.017	0.019	0.007	0.172	--
2-16-88	0.013	0.036	<0.001	<0.001	<0.001	--
5-17-88	0.02	0.029	<0.005	<0.0005	<0.01	--

Source: TriHydro, July 1988

Table 3-12

Organic Groundwater Quality Data, Texaco's Fillmore Pipeline Facility, Fillmore, California (May 1987 - May 1989)

Well and Date Sampled	Volatile Organics					All Others (mg/L)
	Phenols (mg/L)	Benzene (mg/L)	Ethylbenzene (mg/L)	Toluene (mg/L)	Xylene (mg/L)	
MW-14 (continued)						
8-23-88	0.01	0.051	<0.001	<0.001	<0.001	--
11-15-88	<0.01	0.027	0.0061	<0.005	<0.005	--
2-21-89	<0.01	<0.005	<0.005	<0.005	<0.005	--
5-22-89	<0.01	0.005	<0.005	<0.005	<0.005	--
MW-15						
5-20-87	<0.05	0.0010	<0.0001	0.0002	0.028	--
7-31-87	--	<0.0005	<0.0005	<0.0005	<0.0005	--
9-22-87	<0.005	--	--	--	--	--
12-01-87	<0.005	<0.001	0.003	0.002	<0.001	--
2-15-88	0.009	0.025	0.006	<0.001	<0.008	--
5-17-88	<0.01	<0.0005	<0.0005	<0.0005	<0.001	--
8-23-88	<0.01	<0.001	<0.001	<0.001	<0.001	--
11-15-88	<0.01	<0.005	<0.005	<0.005	<0.005	--
*	*	*	*	*	*	*
MW-16						
2-17-88	<0.005	<0.001	<0.001	<0.001	<0.001	--
5-17-88	<0.01	<0.0005	<0.0005	<0.0005	<0.001	--
8-24-88	<0.01	<0.001	<0.001	<0.001	<0.001	--
11-15-88	<0.01	<0.005	<0.005	<0.005	<0.005	--
2-21-89	<0.01	<0.005	<0.005	<0.005	<0.005	--
5-22-89	0.01	<0.005	<0.005	<0.005	<0.005	--
MW-17						
2-16-88	0.030	2.63	0.395	<0.001	1.119	--
5-17-88	0.05	1.20	0.022	0.100	0.049	--
8-24-88	0.06	1.20	0.012	0.120	0.067	--
11-16-88	0.04	1.70	<0.050	0.110	<0.050	--
2-22-89	0.07	0.960	<0.050	0.085	<0.050	--
5-23-89	0.06	1.20	0.012	0.093	0.077	--
P-2						
5-21-87	0.08	2.317	0.796	0.611	0.515	--
7-30-87	--	3.740	0.706	0.421	0.145	--
9-23-87	0.08	--	--	--	--	--
12-03-87	0.037	0.884	0.285	1.300	0.363	--
2-16-88	0.064	1.10	0.275	0.798	1.30	--
5-18-88	0.08	1.50	0.200	0.410	0.400	--
8-24-88	0.08	1.10	0.34	0.32	0.24	--

Source: TriHydro, July 1989

Table 3-13

Organic Groundwater Quality Data, Texaco's Fillmore Pipeline Facility, Fillmore, California (May 1987 - May 1989)

Well and Date Sampled	Volatile Organics					
	Phenols (mg/L)	Benzene (mg/L)	Ethylbenzene (mg/L)	Toluene (mg/L)	Xylene (mg/L)	All Others (mg/L)
P-2 (continued)						
11-16-88	0.05	1.50	0.40	0.39	0.16	--
2-22-89	0.06	1.30	0.500	0.420	0.280	--
5-23-89	0.07	0.540	0.350	0.310	0.530	--

* Well MW-15 was vandalized. No samples were obtainable from this well.

Source: TriHydro, July 1989

The conceptual site model with potential sources, release mechanisms, contaminant migration pathways, and exposure routes is illustrated in Figure 3-3. Migration pathways and human and biota exposure will be fully assessed during the RI/FS investigation.

3.3 Preliminary Public Health and Environmental Impacts

EPA has chosen to perform the risk assessment. Data collected during the RI phase will be evaluated by a qualified EPA scientist to determine if environmental conditions or materials at the site present potential hazards to public health, welfare, or the environment. Existing standards will be reviewed to help formulate conclusions and recommendations regarding the hazard potential of the site. If additional hazards are identified, the risks associated with each hazard will be summarized.

3-23

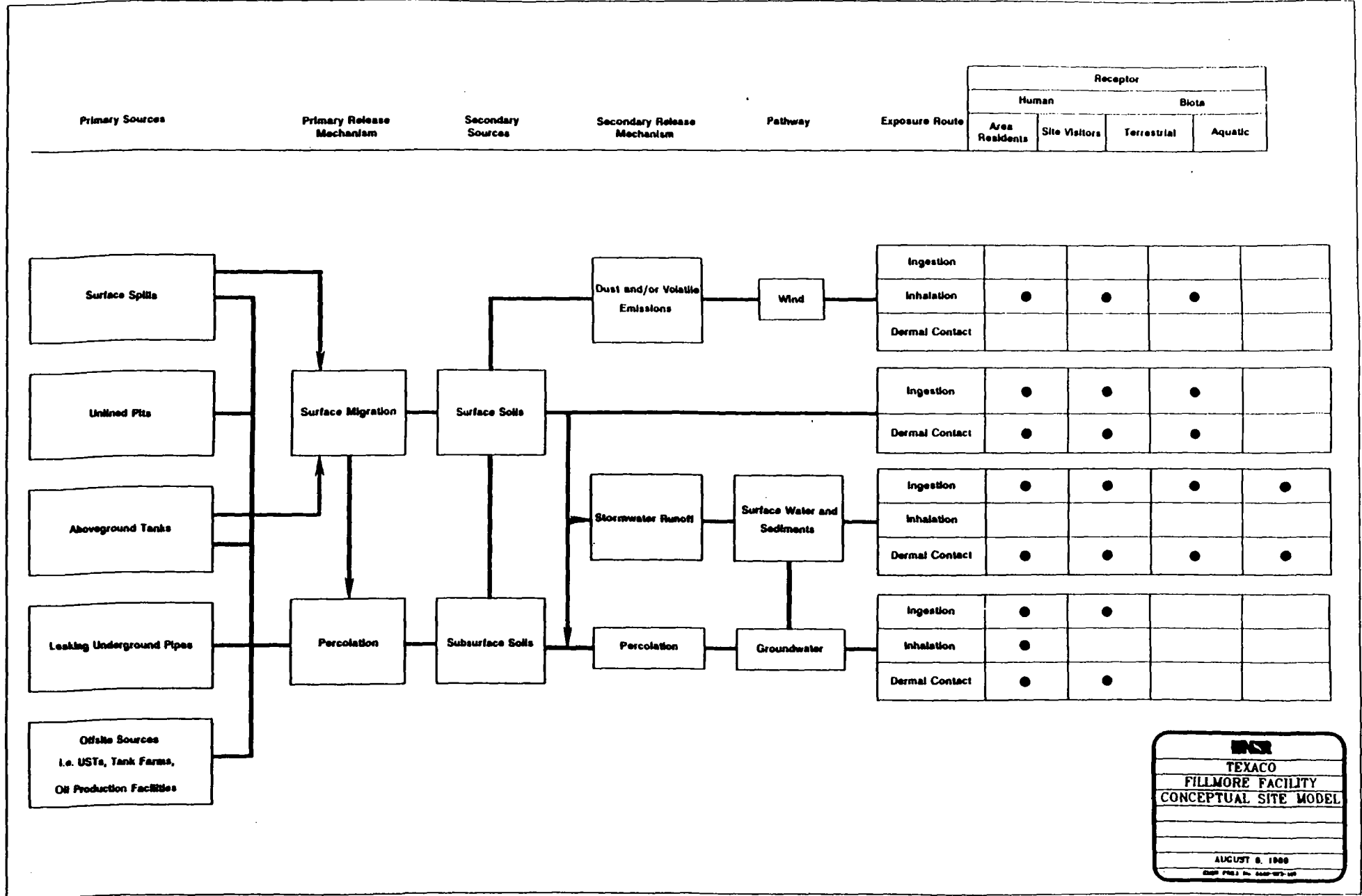


Figure 3-3

4. RI/FS WORKPLAN RATIONALE

The overall objective of the RI is to determine the nature and extent of the threat posed by the release or threat of release of hazardous substances and to evaluate proposed remedies. The ultimate goal of the FS is to select the most cost-effective remedial alternative which mitigates threats to and provides protection of public health, welfare, and the environment, consistent with the NCP (EPA/540/G-87/004). This workplan focuses gathering and evaluating the specific information needed to meet these goals.

This RI/FS workplan is a flexible document with activities that can be expanded, reduced, or eliminated with written approval from the EPA based on the data analyzed during the project. Any change in scope must be approved by the EPA.

The objectives for the RI/FS will be fulfilled through the evaluation of data previously collected and additional data collected during RI/FS activities. Table 4-1 is a preliminary chronological summary of reports and memoranda relating to the Texaco Fillmore site. To supplement existing data, several remedial investigation activities are anticipated to be selected to characterize local hydrogeologic conditions and define the nature and extent of possible soil, groundwater, and surface water degradation within the vicinity of the site that could be considered attributable to Texaco. Ultimately, a recommended remedial action program for the site will be developed at the conclusion of the RI/FS program activities.

The proposed RI/FS workplan separates the RI into four distinct tasks and the FS into three distinct phases. The list of RI/FS tasks is shown in Table 4-2.

TABLE 4-1

**CHRONOLOGICAL LISTING OF ALL REPORTS AND MEMORANDA
IN TRIHYDRO CORPORATION POSSESSION
RELATING TO THE FILLMORE PIPELINE FACILITY PROJECT**

Author	Date	Title
Eschner	05-57	Geology of the Central Part of the Fillmore Quadrangle, Ventura County, California (Masters Thesis), Stanford Eschner, University of California, Los Angeles)
Johnson	07-59	The Geology of the Northeastern Quarter of Fillmore Quadrangle, Ventura County, California (Masters Thesis, Raymond Larry Johnson, University of California, Los Angeles)
Flemal	1966	Sedimentology of the Sespe Formation, Southwestern California (Doctoral Dissertation, Ronald C. Flemal, Princeton University)
USDA	04-70	Soil Survey, Ventura Area, California
Mann	04-20-72	A Plan for Groundwater Management, United Water Conservation District
Radian	10-83	Summary of Remedial Options for Pacific Coast Pipelines Facility
Radian	02-84	Environmental Evaluation, Pacific Coast Pipe Lines Facility
Radian	06-22-84	Conceptual Design of Excavation and Redisposal Remediation Action for Pacific Coast Pipe Lines Facility
Radian	09-84	Contract Documents for Construction at Excavation and Transportation Remedial Action-PCPL Facility - Appendix
Radian	11-25-85	Geohydrologic Investigation of Texaco's Fillmore Pump Station, Fillmore California - Phase II
Radian	01-13-86	Geohydrologic Investigation of Texaco's Fillmore Pump Station, Fillmore, California - Phase II

Source: TriHydro 1989.

TABLE 4-1 (Continued)

Author	Date	Title
TriHydro	03-07-86	Monthly Progress Memorandum, Hydrocarbon Assessment
TriHydro	04-11-86	Monthly Progress Memorandum, Hydrocarbon Assessment
TriHydro	05-30-86	Final Report, Hydrocarbon Assessment
Radian	12-02-86	Groundwater Assessment of Texaco's Fillmore Site
TriHydro	04-08-87	Memorandum - Progress Report, Subsurface Investigation and Remediation Study at TRMI Fillmore Pipeline Facility
TriHydro	05-06-87	Memorandum - Progress Report, Subsurface Investigation and Remediation Study at TRMI Fillmore Pipeline Facility - Monitoring Well Installation
TriHydro	05-27-87	Memorandum - Combustible Gas Survey and Monitoring Well Surveying
ExcelTech	06-87	Soil and Groundwater Investigation for Kayo Oil Company Fast Gas Station
TriHydro	06-15-87	Memorandum - Technical Proposal and Price Quotation for a Pump Test of the Water Supply Well at the Texaco Fillmore Facility
TriHydro	07-08-87	Memorandum - Progress Report, Subsurface Investigation and Remediation Study at TRMI's Fillmore Pipeline Facility
ExcelTech	08-87	Kayo Oil Company Quarterly Groundwater Sampling and Analysis for Fast Gas Station
TriHydro	09-01-87	Groundwater Assessment Progress Report
TriHydro	09-11-87	Progress Report, Bimonthly Groundwater Quality Monitoring Program, TRMI's Fillmore Pipeline Facility, July 1987 Sampling Results
TriHydro	10-87	Groundwater and Assessment Progress Report

TABLE 4-1 (Continued)

Author	Date	Title
ExcelTech	10-87	September Quarterly Groundwater Sampling and Analysis for Kayo Oil Company Fast Gas Station
TriHydro	10-01-87	Groundwater Assessment Progress Report
TriHydro	01-20-88	Memorandum - Monitoring Well Installation at Fillmore Pipeline Facility
TriHydro	02-02-88	Memorandum - Activity Schedule
TriHydro	06-27-88	Groundwater and Soils Assessment Progress Report (Draft)
TriHydro	07-25-88	Memorandum - Progress Report, Groundwater Quality Monitoring at TRMI's Fillmore Pipeline Facility
TriHydro	09-08-88	Environmental Assessment, Texaco Fillmore Facility and Adjacent Neighborhood Properties
Ensco	01-89	December Quarterly Groundwater Sampling and Analysis - Fast Gas
TriHydro	01-12-89	Memorandum - Water Quality Monitoring Results
TriHydro	07-12-89	Memorandum - Water Quality Monitoring Results
Ensco	08-89	June Quarterly Groundwater Sampling and Analysis - Fast Gas

TABLE 4-2

TEXACO FILLMORE PROPOSED RI/FS TASKS

RI Activities

Task I	Project Planning/Scoping
Task II	Field Activities
Task III	Treatability Studies
Task IV	RI Report

FS Activities

Task V	Evaluation of RA Alternatives
Task VI	FS Report
Task VII	Conceptual Design

5. REMEDIAL INVESTIGATION ACTIVITIES

5.1 Task I - Project Planning Activities

The scope of Task I activities is designed to establish a data base for assessing the magnitude of release of contaminants from the Texaco Fillmore site. A complete review of the existing data base will be conducted and all available site data will be compiled into a Site Background Summary Report. A Health and Safety Plan (HSP) and a Sampling and Analysis Plan (SAP) will also be compiled during Task I activities. The SAP will incorporate both the Field Sampling Plan (FSP) and the Quality Assurance Project Plan (QAPP).

The SAP will identify the specific field activities to be completed as part of Task II. RI/FS Task I activities will include monthly status reports to EPA describing previous month's activities. Task I will conclude with a review meeting to consider the Site Background Summary, the HSP, and SAP.

5.1.1 Continued Monitoring of Well Network

Texaco has been conducting groundwater monitoring activities at the subject site since 1983. An initial site assessment and groundwater investigation workplan was submitted to the RWQCB and the DHS in July 1983. The workplan was approved on July 25, 1983. Since then, Texaco has been conducting a comprehensive groundwater quality monitoring program in cooperation with the RWQCB.

Sampling and analysis of the monitoring well network installed during the pre-RI/FS investigations will be continued concurrent with Task I activities. Texaco may broaden the scope of the groundwater monitoring activities to include analysis for additional chemical compounds. The SAP will contain a detailed groundwater quality monitoring program for approval by EPA.

5.1.2 Site Background Summary

A Site Background Summary will be compiled using all available site data. The summary will help to determine the need for additional site characterization data and will help to define applicable or relevant and appropriate requirements (ARARs). The Site Background Summary will address the following.

- Historic Operations
- Local Physiographic Setting
- Nature and Extent of Problem
- Preliminary Site Boundary
- Preliminary Identification of ARARs
- Preliminary Identification of Remedial Technologies
- Identification of the Need for Treatability Studies
- Identification of Additional Data Needs

5.1.3 Sampling and Analysis Plan (SAP)

A Sampling and Analysis Plan will be prepared to specify the conduct of Task II field activities. The SAP will incorporate both a FSP and a QAPP. The FSP will be conducted consistent with the "Region IX Example Sample Plan" for PRPs which EPA will provide.

The FSP will propose field sampling activities and a sampling protocol based on the findings of the Site Background Summary report. The FSP will furnish detailed information on all sampling locations and procedures and will address the following topics:

- Site background and setting
- Site objectives

- Sample Location and frequency
 - Field analyses
 - Chemical analyses
 - Physical testing/analysis
 - Biological analysis
- Sample designation
- Sampling equipment and procedures
 - Drilling - number and locations of borings and monitoring wells
 - Borehole logging
 - Installation procedures for monitoring wells
 - Monitoring well materials and construction
 - Procedures for hydraulic testing of wells
 - Water-level measurement procedures and equipment
 - Groundwater quality sampling
 - Surface water quality sampling and analysis procedures
 - Stream sediment sampling and analysis procedures
 - Soil vapor surveying
 - Sample containers
 - Equipment decontamination
 - Calibration of field instruments
 - Abandonment of boreholes and disposal of cuttings
- Sample handling and analysis
 - Preservation
 - Field procedure documentation
 - Field logbook
 - Labels and seals

- Chain-of-custody records
- Sample analysis

Copies of the draft FSP will be provided to the EPA for review and comment. Upon receipt of written review comments, the FSP will be revised, finalized, and submitted to EPA for approval.

A QAPP will be prepared and will include a full description of QA/QC practices required for field investigations and sample analyses. The QA/QC Plan will be developed in conformance with EPA "Interim Guidelines and Specification for Preparing Quality Assurance Project Plans" (QAMS-005/80). Copies of the draft QAPP will be submitted to the EPA for review and comment. Upon receipt of written review comments, the QAPP will be revised, made final and submitted to EPA for approval.

5.1.4 Health and Safety Plan (HSP)

A site health and safety assessment based on available site information will be conducted to determine if the site has potentially hazardous chemical exposure levels in the air or dangerous physical features. All available site information will be examined to select possible sources of hazardous air emissions and potentially hazardous areas.

Findings of the assessment and available information will be used to develop a Health and Safety Plan (HSP) that will specify the field monitoring to be performed and the protective gear to be worn by site visitors and investigators during conduct of investigations.

The HSP will include recommendations for air sampling during well installation and soil boring. Development of the program will consider past experiences during waste disposal area excavation activities and monitoring well and soil boring construction

activities on the Texaco property. Currently, it is anticipated that hand-held organic vapor analyzers will suffice for air quality sampling during the Task II field program. The plan will focus on the use of personal protective equipment to minimize exposure to hazardous materials through inhalation or direct contact when performing work on or near the site.

Copies of the draft HSP will be provided to EPA for review and comment. Upon receipt of written review comments, the plan will be revised and finalized.

5.2 Task II - Field Activities

The scope of this task will focus on field activities necessary to fill data gaps where available data are not adequate to complete the RI/FS or to support an RI/FS decision regarding site remediation. Data inadequacies are known and/or suspected in the characterization of local hydrogeologic conditions and the nature and extent of possible soil, groundwater, and surface water degradation within the vicinity of the site area that could be considered attributable to Texaco.

It is anticipated that Task II will be separated into seven distinct field activities with separate deliverables. The proposed activities and resulting deliverables are listed in Table 5-1.

5.2.1 Hydrogeologic Investigation

The objective of this activity is to conduct a hydrogeologic investigation that will provide the following:

- data needed to determine the nature of groundwater contamination and delineate the present horizontal and vertical contaminant concentration gradients,
- hydrogeologic data needed to guide potential future remedial actions and support the feasibility study,

TABLE 5-1

TEXACO FILLMORE SITE
PROPOSED TASK II
FIELD ACTIVITIES AND DELIVERABLES

<u>Activities</u>	<u>Deliverable</u>
Hydrogeologic Investigation	Report
Subsurface Soil Investigation	Report
Soil Vapor Investigation	Report
Surface Water and Stream Sediment Investigation	Report
Surface Soil Investigation	Report
Air Investigation ^a	Report ^a
Completion of Field Support Activities	Technical Memorandum

^a Adequacy of existing data not yet evaluated.

- a groundwater monitoring network to detect current and future movement of any existing groundwater-borne contaminants and to assess results of potential future remedial actions,
- data to help determine the effect of pumping near the site on groundwater flow rates and directions, and to provide a conceptual model of the relationship of major faulting to the gradients.

5.2.1.1 Installation of Monitoring Wells

The number and location of monitoring wells will be determined as a part of the Sampling and Analysis Plan. It is anticipated that approximately seven new monitoring wells will be installed to fill in apparent data gaps. Preliminary locations of seven additional wells are illustrated in Figure 5-1 though it may be necessary to locate the wells farther from the site to determine the lateral extent of contamination. The proposed locations will be finalized after completion of the Site Background Summary Report. New monitoring wells may include well clusters in which multiple wells screened at different vertical intervals are located together. Well locations and vertical spacings will be located to accomplish the following objectives:

- Identify "background" conditions upgradient of the Texaco site and other potential contamination sources.
- Determine the nature and extent of groundwater contamination downgradient of the Texaco site and resulting from the Texaco site.
- Determine groundwater quality in the vicinity of Pole Creek Flood Control Channel where surface and/or groundwater from the Texaco site may have discharged to surface water prior to the lining of Pole Creek.
- Characterize the hydrogeologic system and groundwater quality sufficiently to predict the movement and fate of groundwater contamination.
- Gather sufficient data to support the determination and design of a remedial action approach.

Technical specifications for drilling, casing, and developing new monitoring wells will be included in the Task II Sampling Plan. Drilling and well design will conform with existing EPA and local regulations. A geologist, hydrogeologist, or geotechnical engineer will be with each drill rig to log subsurface borings and ensure that the wells are properly installed.

Boreholes for each well shall be drilled in soil using hollow-stem augers whenever possible. Deeper wells may require dual tube air percussion or other method of drilling. A preferred method of drilling for each well will be specified in the Sampling and Analysis Plan; however, changes in installation techniques may be necessitated by conditions encountered in the field. The final responsibility for selecting the well installation method is held by the field geologist or engineer and the EPA representative.

When drilling each well, samples will be collected for possible future grain size analysis, index testing, and lithology analysis. Samples will be properly packaged and stored. Samples will be analyzed at a later date should they be necessary to remedial action design or other RI/FS requirements. At locations where more than one new well is to be constructed, formation samples will be collected from only the deepest borehole in the cluster. A California split-spoon sampler with three brass sleeves will be used to collect soil samples at selected regular intervals, as well as at the water table and changes in lithology. The sampling interval will be specified in the Task I Sampling and Analysis Plan. The samples will be stored out of sunlight and above freezing and will be made available to the EPA upon request. Capillary column, HPLC or other appropriate methods may be used to screen soil samples to determine approximate contamination levels in the field. The Task I Sampling and Analysis Plan will specify the field screening technique(s) as well as back up alternative procedures.

In selected boreholes, cores will be collected to evaluate the vadose zone. The precise length of coring will be determined in the field. A cement-bentonite slurry or equivalent will be used to replace the borehole.

Characterization monitoring wells will be constructed using, at a minimum, 4-inch inside-diameter flush joint threaded blank PVC pipe fitted with an appropriate length of slotted PVC. Well materials, diameters, and construction will be specified in the Task I Sampling and Analysis Plan. The length of well screen will be determined in the field, but is generally expected to be 10 to 20 feet for characterization work and 5 or 10 feet for quantitative monitoring. The screened interval will be determined in the field based on the location of the water table, results of field screening of soil samples, and other field data. The screened interval selected for shallow borings generally will be situated in the interval of greatest contamination or intersecting the water table.

Each well will be surveyed to establish its location, the elevation at the top of the casing, and the ground-surface elevation. Elevations will be tied to the USC and GS and California coordinate system.

Aquifer response tests will be performed at selected wells to determine aquifer hydraulic properties. Rising or falling head tests will be conducted at selected wells. In addition, aquifer testing (pump tests) may be deemed appropriate at selected locations. The Task I Sampling and Analysis Plan will specify the type and location of selected aquifer test to be conducted. It is anticipated that additional tests will be conducted during subsequent tasks of the RI/FS in conjunction with the hazardous assessment or selection and design of remedial alternatives.

Drilling equipment and soil sampling equipment will be properly decontaminated to prevent cross-contamination of soil samples, boreholes, and monitoring wells. Well screen and riser pipe will be similarly decontaminated prior to installation. The Task I SAP will specify decontamination procedures in detail.

5.2.1.2 Water Level Monitoring Program

The objectives of the water level monitoring program are the following.

- to determine the general configuration of the water table and thus groundwater flow patterns in the vicinity of the Texaco site,
- to determine typical seasonal patterns in the configuration of the water table, and
- to investigate surface-water and groundwater interaction.

The specific water-level monitoring program to accomplish these objectives will be described in detail in the Task I SAP. At present, it is anticipated that a monitoring program for water levels will include but may not be limited to the following.

- one or two continuous water level recorders located near the southern part of the Texaco property,
- monthly and/or quarterly water level measurements during an approximately year-long period at selected wells in all directions about the Texaco property, and
- monthly monitoring of one or more groundwater wells in the general vicinity of Pole Creek Flood Control Channel.

If appropriate, stage measurements will be made in Pole Creek Flood Control Channel.

Water-level measurements in groundwater wells will conform with standard practice. Water levels will be measured to an accuracy

of 0.01 feet. Measuring equipment will be properly decontaminated after measurements. Details of measuring protocol and decontamination procedures will be described in the Task I SAP.

5.2.1.3 Sampling and Analysis of Groundwater

A groundwater sampling plan will be proposed in the Task I Sampling and Analysis Plan. At least quarterly rounds of sampling will be conducted. Wells to be sampled will include all new monitoring wells plus additional existing wells sampled during the preliminary sampling round and the appropriate unsampled offsite wells. Existing wells to be included in the sampling rounds will be selected based on several criteria, including but not limited to:

- well construction, integrity, and security;
- areal coverage in groundwater sampling;
- detection of contamination in previous sampling events;
- use of well for water supply; and
- physical accessibility of well.

Sufficient wells will be included in the sampling event to enable groundwater contamination downgradient of the Texaco property and any nearby contamination sources to be characterized. It is possible that as more is learned of the nature and extent of contamination in the first sampling round, changes in the sampling program will be recommended for the second sampling event.

Wells will be sampled in accordance with the Task I Sampling and Analysis Plan which will provide specific direction for sampling activities. New monitoring wells will be allowed to equilibrate following well installation and development before the wells are sampled. Prior to sampling, water-level measurements will be taken in monitoring wells and existing wells in which water-level measurements are possible. For water-quality sampling, Texaco

monitoring wells may be equipped with dedicated Teflon tubing and/or Teflon or stainless steel bailers. Other wells will, if feasible, be similarly equipped with dedicated sampling equipment. Otherwise, properly decontaminated sampling equipment will be used.

Prior to sampling, wells will be purged of a sufficient volume of water to ensure that samples are representative of the formation. This will be accomplished by either:

- measuring conductivity, temperature, and pH of the purge water, and purging until these parameters have stabilized; or
- purging a minimum of five well bore volumes.

Wells will be purged by peristaltic or submersible pump if this is feasible based on the well construction and depth. Otherwise, the wells will be purged by bailing or other acceptable methods. Samples will be collected in appropriate containers using the peristaltic pump and Teflon tubing or bailing techniques. Volatile organic compound samples, however, will be collected using a bailer. Other acceptable sampling techniques may be presented in the approved QAPP. Groundwater sampling and shipping procedures will conform with the approved Task I Sampling and Analysis Plan. The sampling program will include an appropriate number of duplicate and field blank samples.

The EPA will be informed that a sampling event is planned at least 2 weeks prior to its occurrence. EPA may supply a representative(s) to observed well sampling. Texaco will split samples with the EPA upon request.

Parameters to be measured by laboratory analysis will be determined as a part of Task I activities. Texaco will select the laboratory for analysis, subject to EPA approval of the laboratory.

5.2.1.4 Hydrogeologic Study Report

Texaco will prepare and submit to EPA a report summarizing the results of the hydrogeologic investigation. The document will include data obtained during the monitoring well installation and the water-level monitoring programs. Borehole logs, formation sample data, geologic cross-sections, potentiometric-surface maps, and water-level elevation data will be included.

This report will also include results for the water-quality analysis and data from the groundwater sampling and analysis program and will include, if appropriate, interpretations such as groundwater quality iso-concentration maps. Interpretations of groundwater/surface water-interaction and groundwater transport pathways will be included.

5.2.2 Subsurface Soil Investigation

An investigation of the subsurface soil contamination will be conducted to determine the horizontal and vertical extent of soil contamination so that an appropriate remedial action can be designed.

5.2.2.1 Subsurface Soil Borings

The extent of the subsurface soil investigation will be consistent with the degree to which various areas of the site are believed to be contaminated. The subsurface soil sampling plan will employ the results of the Task I Site Background Summary to determine those areas of the site where additional investigation may be required, including known areas of waste disposal and high soil vapor concentrations.

It is anticipated that boreholes will be situated in the vicinity of the main waste pit, elevated soil vapor concentrations in the

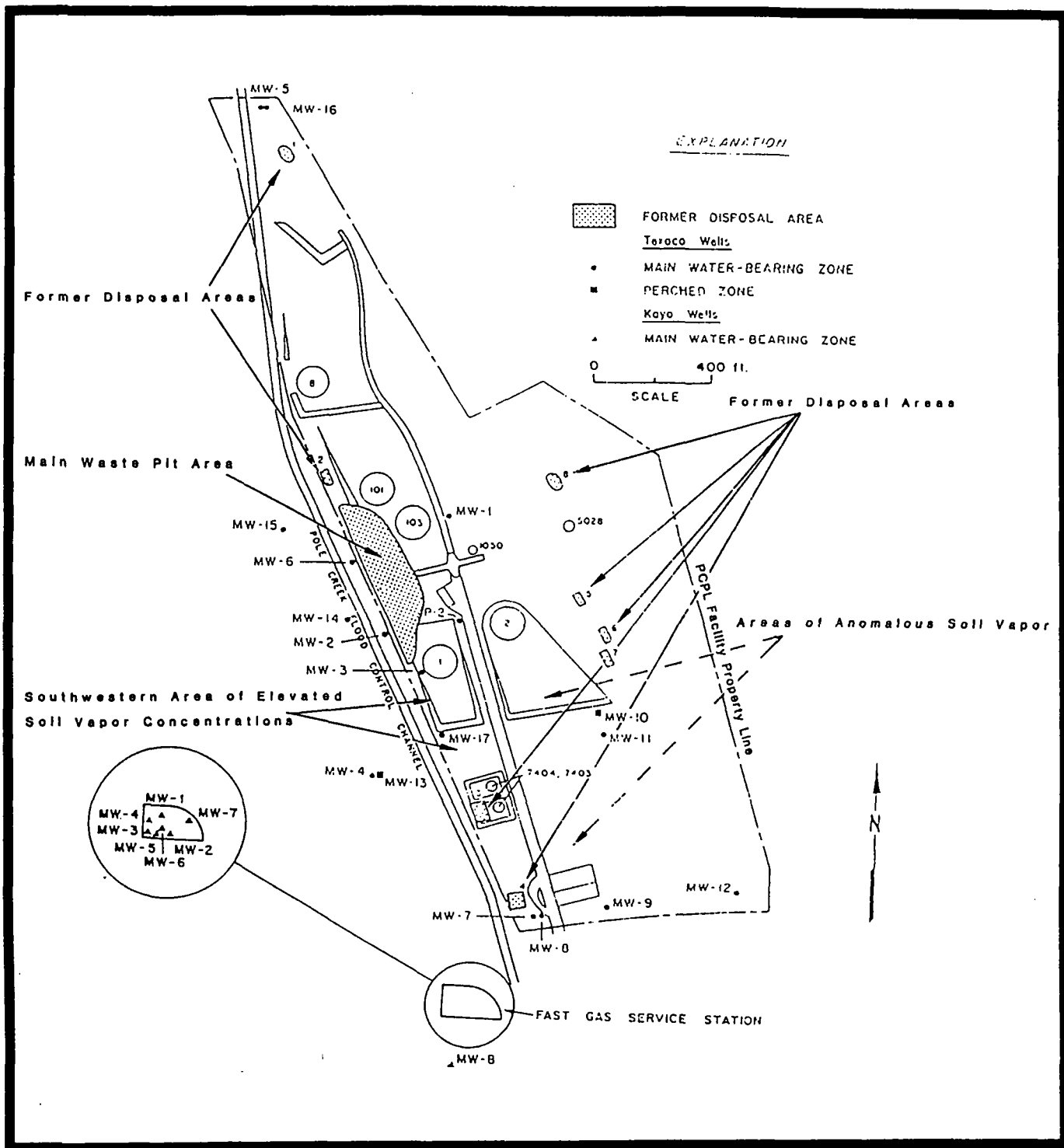
southwestern portion of the facility, over former disposal areas, and near other anomalous soil gas readings which may indicate sources such as leaking underground pipes. The general areas where boreholes will be located are illustrated in Figure 5-2.

Borings will be sampled in accordance with the Task I SAP which will provide specific directions for sampling activities. The sampling program will include an appropriate number of replicate samples for QA/QC purposes. Borings in known or suspected waste disposal areas will be sampled as follows: samples will be taken at 5-foot intervals or at significant changes in lithology to a depth of 5 feet below the lower extent of identifiable waste material or leachate penetration that is above groundwater as determined visually and by field PID or FID. The depth of each boring will be determined in the field by a geologist attending the drill rig. The need for continuous cores will be determined in the Task I Site Background Summary.

Other areas of the site may require less extensive soil investigation. For other areas believed to be minor sources of contamination to groundwater, soil will be sampled at selected locations specified in the Task I SAP.

5.2.2.2 Subsurface Soil Investigation Report

Texaco will prepare and submit to the EPA a report summarizing the results of the subsurface soil investigation. The document will include borehole logs, formation sample data, geologic cross-sections and, if appropriate, interpretations such as vadose zone contaminant isoconcentration maps. Geotechnical data and interpretations of significant leachate transport pathways will be included.



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Figure 5-2. Areas of Proposed Borehole Placement

5.2.3 Soil Vapor Investigation

If appropriate, based on the Task I Site Background Summary, a Soil Vapor Investigation will be implemented to aid in the determination of source areas and delineation of vadose zone and possibly groundwater degradation.

Soil vapor activities will be done in accordance with the Task I SAP. If implemented, the Soil Vapor Investigation will be conducted with a portable PID/GC with appropriate column(s), and Texaco will prepare and submit to the EPA a report summarizing the results of the investigation.

5.2.4 Surface Water and Stream Sediment Investigation

Water courses, drainage ditches, and other surface-water drainageways from the site have the potential to act as pathways for contaminant migration. Texaco will employ the site topographic survey and a field site reconnaissance to determine surface-water drainageways from the site. These will be mapped on the site topographic map. The major watercourses to which the site drainages are tributary will also be identified.

The presence of contaminants in the site drainage will be evaluated in sediment and water samples taken from selected site surface-water drainages. Water sampling is not likely to be possible in drainways because all are likely to be dry most of the time. Nevertheless, sediment samples may be obtained from dry drainways. The number and location of all samples will be specified in the Task I Sampling and Analysis Plan.

The surface water and stream sediment investigation results will be summarized in a Surface Water and Stream Sediment Investigation Report prepared by Texaco. The report will describe the general site hydrologic regime, the drainage patterns from the site, the

ultimate destinations of the site drainages, the sampling and analysis program, and the analytical test results. Copies of the report will be submitted to the EPA.

5.2.5 Surface Soil Investigation

It is probable that an investigation of the surface soil will be conducted to characterize the potential for soil ingestion and dust dispersion exposure risks.

The extent of the surface soil investigation will be consistent with the degree that various areas of the site are believed to act as sources for ingestion and inhalation exposure risks. The surface soil investigation will be based on the results of the Task I Site Background Summary.

The depth for sampling will be limited to the upper 18 inches of soil. Parameters to be measured by laboratory analysis will be determined as part of the Task I activities. Texaco will select the laboratory for analyses, subject to EPA approval of the laboratory.

It is anticipated that the main waste pit and the other disposal pits will be sampled, and in addition background samples may be collected.

5.2.6 Air Investigation and Report

If appropriate, based on the Task I Site Background Summary, an Air Investigation will be implemented to determine the extent of atmospheric contamination from those contaminants existing at the site. If implemented, this air investigation will assess the potential for the contaminants to enter the atmosphere and the anticipated fate of airborne contaminants.

The air investigation report will provide a summary of investigation activities, analysis of analytic data, laboratory reports, and QA/QC documentation.

5.2.7 Technical Memorandum: Completion of Field Support Activities

Texaco will prepare and submit to the EPA a Technical Memorandum summarizing the scope of all field support activities. This document will include a summary of the data collected during the individual field investigations.

5.3 Task III - TREATABILITY STUDIES

The scope of this phase will focus on activities necessary to provide additional information on technologies identified during the alternative development process.

The objectives of the treatability studies are:

- Provide sufficient data to allow treatment alternatives to be fully developed and evaluated during the detailed analysis and to support the remedial design of a selected alternative.
- Reduce cost and performance uncertainties for treatment alternatives to acceptable levels so that a remedy can be selected.

A decision on whether it is necessary to conduct treatability testing will be made as early as possible in the RI/FS process and may be made during the initial project scoping.

If it is necessary to conduct treatability studies, Texaco will prepare and submit to the EPA a treatability test workplan.

5.4 Task IV - REMEDIAL INVESTIGATION REPORT

A draft Remedial Investigation Report will be prepared to consolidate and summarize the data collected during the RI. It will include a discussion of the data and the hazard identification and risk potential of the contaminants detected. The RI report will provide data sufficient to allow evaluation of the need for source control or management of migration measures, both specific to identified Fillmore site contaminant releases. The draft RI report will be submitted to EPA for review. The EPA will submit written comments on the draft RI report to Texaco. Texaco will address these comments, revise the RI report appropriately, and submit a draft final RI report.

6. FEASIBILITY STUDY ACTIVITIES

The objective of the Feasibility Study will focus on the development of cost-effective remedial alternatives that effectively mitigate and minimize threats to and provide adequate protection of public health and welfare and the environment caused by hazardous contaminants released from the Texaco facility. Hence, the FS workplan that follows is a flexible document with work elements that can be expanded, reduced or eliminated with written approval from EPA based on the data gathered during the project. Any change in scope must be reviewed with and approved by EPA.

6.1 Task V - Evaluation of Remedial Action Alternatives

In the Site Background Summary, a preliminary listing of potentially feasible remedial technologies will be developed. This list of technologies will be refined and additions or deletions made to reflect the site Remedial Action Objectives. The refined technologies will be evaluated and documented for consideration as remedial action alternatives. An alternative or combination of alternatives will be selected for implementation at the site.

6.1.1 Identification of Remedial Technologies

Throughout the RI, data will be evaluated to determine whether additional potentially feasible remedial actions are suggested by the data. If additional technologies appear to be cost-effective, a recommended scope of work for additional investigations (if necessary) to evaluate such technologies will be prepared.

Likewise, if RI proves that some of the previously considered remedial actions are not feasible, a review meeting including EPA and Texaco will be conducted to determine the desirability of

eliminating proposed investigative work associated with such actions.

The revised List of Remedial Technologies will be used as a basis for discussion during the review meeting described below.

Texaco will prepare a summary of the potentially feasible remedial technologies included in the revised list. To determine the viability of the various alternatives, the following factors will be qualitatively evaluated.

- The ability of the alternative to control onsite releases or to mitigate offsite impacts (high, medium, low).
- The adverse environmental impacts of each alternative (high, medium, low).
- The feasibility, applicability, and reliability of the alternative for locations and conditions of release (yes, no, or potential).
- A preliminary cost estimate indicator (high, medium, low) for both capital and operation and maintenance costs.

A review meeting including EPA and Texaco will be held to (1) refine remedial action objectives, (2) review the revised list of potentially feasible remedial technologies, and (3) review the viability of the various alternatives.

On the basis of the review meeting, an agreement will be reached on the potentially feasible remedial technologies to be evaluated in the initial screening of alternatives.

6.1.2 Update Workplan

Based on the number, complexity, and type of remedial technologies to be screened initially, the scope of work for the FS may need to be adjusted. If necessary and at the request of EPA, a draft of a revised workplan and scope of work will be prepared after the

review meeting. Review comments will be received from EPA and the final plan will be submitted for approval and authorization to proceed after receipt of the review comments.

6.1.3 Development and Screening of Remedial Technologies

Screening criteria will be prepared to assess the potentially feasible remedial technology. The factors to be addressed in developing the screening criteria will include.

- *Environmental.* The adverse impacts and the effectiveness of the remedial technology in mitigating danger to public health, welfare, and the environment will be identified. Included in the criteria will be public acceptability, institutional issues (e.g., implementation capability), and legal issues (e.g., ability to obtain permits, etc.)
- *Engineering.* Remedial technologies must be technically feasible in light of the site location and conditions, must be applicable to the project needs, and must be a reliable method of solving the problem.
- *Economic.* Comparative capital and long-term operation and maintenance costs will be estimated and a present worth value determined for cost comparison. Remedial technologies that far exceed the costs of other technologies but do not provide substantially greater benefits will be dropped from consideration.

A list of specific screening criteria will be prepared and the potentially feasible remedial technologies will be screened according to these criteria. On the basis of this screening, five to seven of the individual or combination of individual remedial technologies will be selected for evaluation in the Detailed Analysis of Alternatives. The identification and screening of remedial technologies will be documented by Texaco in a report entitled, Identification and Screening of Remedial Technologies Report.

A review meeting will be held by EPA and Texaco to review the screening process and to discuss and approve or modify the five to seven alternatives selected for detailed evaluation in this report.

6.1.4 Detailed Analysis of Alternatives

The remaining five to seven alternatives will be analyzed in detail to determine which of the actions or combination of actions represents the most cost-effective remedy for the site. Additional engineering studies may be required to fully evaluate the cost, constructibility, applicability, or reliability of each remaining alternative. These studies may include gathering additional data on the hydrogeologic systems or the distribution of soil materials.

If treatment of contaminated materials is included in the list of potential remedial technologies, a technical assessment of this technology will be conducted to identify applicable processes. The data for this technical assessment will be gathered from existing literature; no laboratory studies are anticipated.

Using data collected in the previous tasks, a detailed written description of each of the five to seven alternatives will be prepared to a level of detail sufficient to allow a comparison of alternatives. The following information will be included in the written description.

- Basic component diagrams for each alternative to be considered, including design criteria, quantities of materials to be handled, efficiency of contaminant removal, and other basic information,
- Major equipment needs and utility requirements,
- Conceptual size layout drawings, and
- Preliminary implementation schedule including procurement, construction, and length of O&M period required to achieve objectives.

Following the preparation of the detailed alternative descriptions, environmental, engineering, and economic assessments of the five to seven alternatives will be conducted.

A comparative assessment of the environmental effects of the remaining alternatives will be conducted to determine:

- The adverse environmental impacts of the alternatives, including potential risks to the public during construction and operation.
- The effectiveness in mitigating adverse impacts.
- The adequacy of source control remedial measures.
- The effectiveness of offsite control measures in mitigating the danger or threat of danger to the public or the environment.
- The public acceptability of the alternatives.
- An assessment of the environmental and health risk associated with each alternative.
- The institutional and legal constraints (environmental permits) that could affect the implementation of the alternatives.

The engineering aspects of the remaining alternatives will be assessed on the basis of acceptable engineering practices. The specific factors to be evaluated will include:

- Reliability.
- Established technology.
- Suitability to control the problem.
- Risks to the health and safety of construction and operational personnel.
- Constructibility and operability in light of site conditions.
- Maintainability and sensitivity to upset.
- Offsite transportation and disposal capacity requirements.

Construction and operating and maintenance costs will be estimated for each alternative. The comparative cost impacts of health and safety requirements on construction and continuing operation and maintenance will be included in the cost estimates. Comparative cost estimates will also be prepared.

After completion of the cost estimate, an economic analysis considering the time value of money will be conducted to allow comparison of the alternatives. A present worth analysis will be conducted for each alternative to permit such a comparison. EPA guidance will be used to select an amortization rate for use in the present worth analysis.

6.1.5 Conduct Comparative Ranking of Alternatives

After completion of the detailed analysis of alternatives, the alternatives will be ranked within each assessment category and overall rankings prepared reflecting all three categories (environmental, economic, and engineering). Procedures specified in the "Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA" (EPA/540/G-89/004) will be followed. This ranking will be based on professional judgment and will reflect the considerable EPA, state, local, and public input received. Based on the data collected in the RI, an endangerment assessment of the no action alternative will be included for comparison with the other alternatives.

A report entitled Detailed Analysis of Alternatives Report will be prepared summarizing the assessment process and the comparative rankings. A review meeting including EPA and Texaco will be held to achieve agreement on the comparative rankings.

6.2 Task VI - Feasibility Study Report

A draft alternative remedial action FS report will be prepared that summarizes all the data developed during the FS and documents the alternative remedial actions assessment process. In this draft report, one alternative or a combination of alternatives will be recommended to the EPA for implementation at the site.

The draft FS report will be submitted to the EPA for review. The EPA will submit written comments on the draft FS report to Texaco. A review meeting including EPA and Texaco will be held to provide clarification and address uncertainties. Texaco will address the comments and revise the FS report appropriately. The final FS report will be prepared for use in the EPA's development of the Record of Decision.

6.3 Task VII - Conceptual Design

6.3.1 Preparation of Conceptual Design Elements

The purpose of this task is to define the selected remedial action alternative(s) for approval by EPA. Conceptual design elements that may be required will include, but not be limited to:

- A conceptual plan view drawing of the overall site showing general locations for project actions and facilities.
- Conceptual layouts (plan and cross-sectional views where required) for the individual facilities, other items to be installed, or actions to be implemented.
- Conceptual design criteria and rationale.
- A description of types of equipment required, including approximate capacity, size, and materials of construction.
- Process flow sheets, including chemical consumption estimates and a description of the process.
- An operational description of process units or other facilities.

- A discussion of potential construction problems.
- Utility requirements and rationale.
- Closure and long-term monitoring requirements and rationale.
- Performance standards to define the levels of cleanup required to complete the remedial action.
- Right-of-way requirements.
- A description of technical requirements for environmental mitigation measures.
- Additional engineering data required to proceed with design.
- Construction permit requirements.
- An Order-of-Magnitude implementation cost estimate.
- An Order-of-Magnitude annual O&M cost estimate.
- A preliminary project schedule.

Additional work may be required to supplement the conceptual design. Examples of some additional activities are:

- Review of the community relations concerns and environmental impacts of the remedial actions.
- Refinement of environment permit and institutional requirements.

6.3.2 Conceptual Design Report

A draft report summarizing the conceptual design data will be prepared and submitted to EPA for review. A review meeting will be scheduled following submittal of this draft. After receipt of written comments on the draft, the report will be finalized and provided to the EPA for final review and approval.

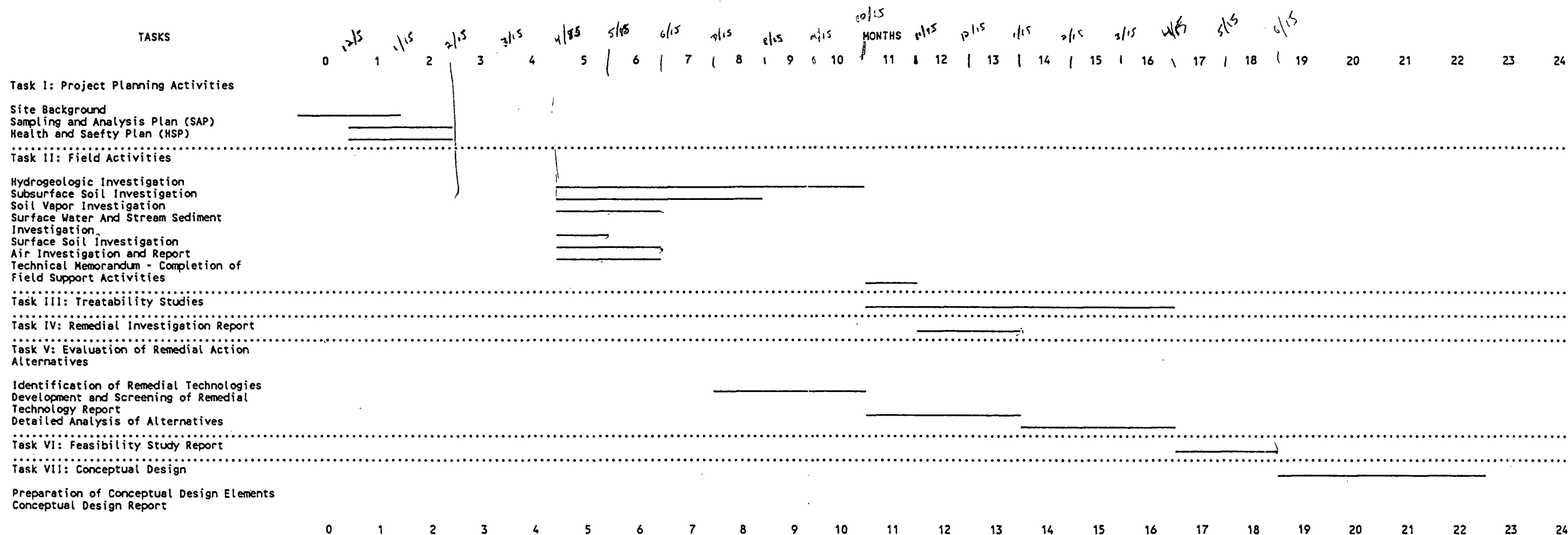
7. PROJECT SCHEDULE AND DELIVERABLES

Texaco will commence the Task I RI/FS activities on the effective date of the consent order. A schedule of RI/FS activities is presented in Table 7-1.

Although time requirements for several of the individual activities can be estimated accurately, the schedule will depend on variables, including availability of QA/QC data from previous investigations, length of time for EPA review and approval of documents, and completion of preceding tasks.

Lists of all Texaco Fillmore RI/FS deliverables including technical memorandums, plans, and reports are included in Tables 7-1 and 5-1 of this workplan.

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TABLE 7-1

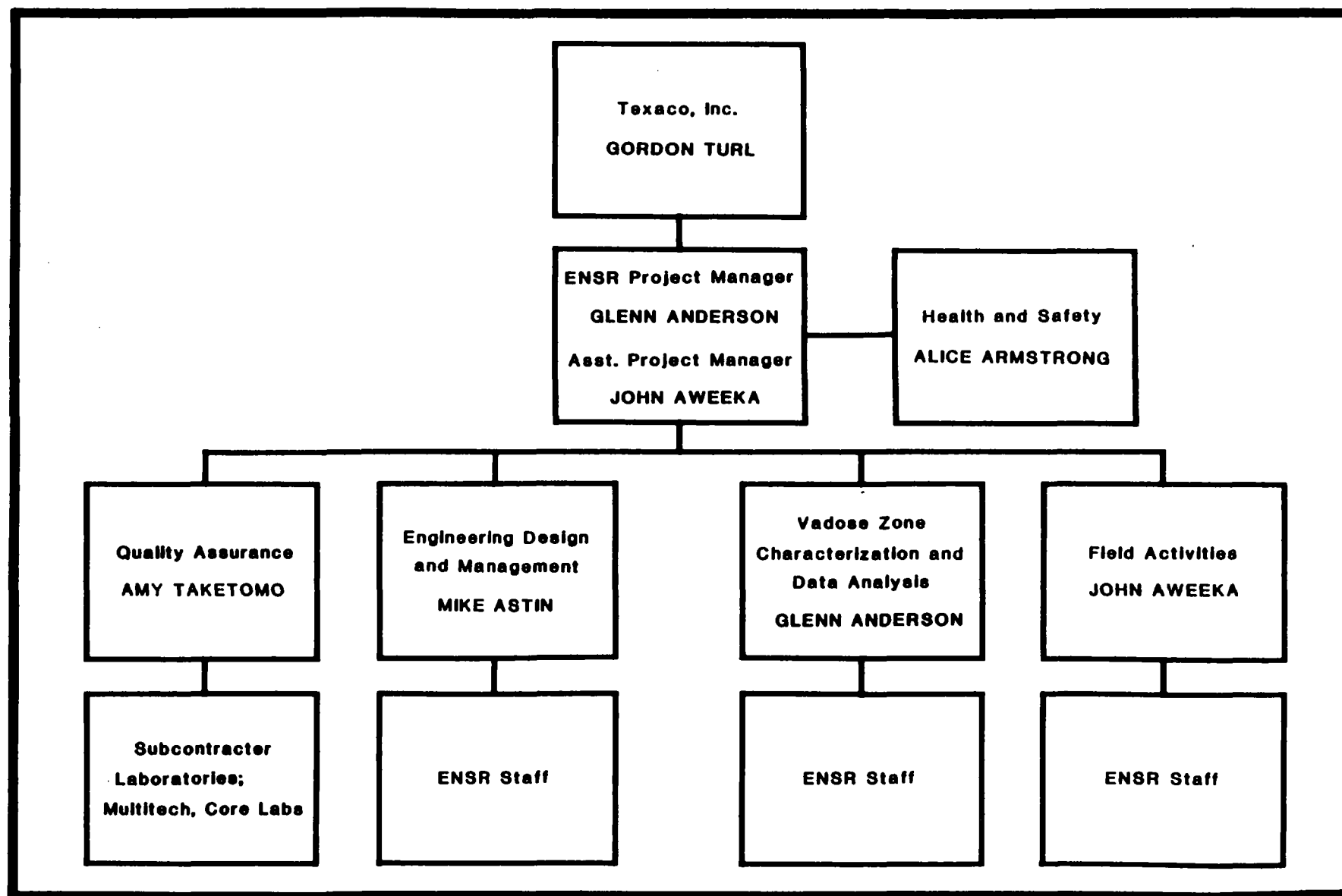
TASKED RI/FS SCHEDULE
TEXACO FILLMORE FACILITY INVESTIGATION

8. PROJECT MANAGEMENT

Texaco will be responsible for conducting the activities described in this workplan in accordance with specified plans for the various phases approved by the EPA. Texaco will ensure that the EPA is apprised of all RI/FS activities through summary technical status reports submitted monthly, through project deliverables indicated in Section 7, and through notices to the EPA at least 2 weeks before field activities are to be initiated.

The monthly summary technical report will include a discussion of the progress made since the previous report, problem areas and recommended solutions, problems that have been resolved, and activities planned for the next reporting period.

Figure 8-1 shows the organizational structure for this RI/FS project. This project will be directed by a geologist registered in the State of California.



ENSR Drawing No. 6600-023-100

Figure 8-1. Project Organization Chart

APPENDIX
RESUMES

GLENN RICHARD ANDERSON

PROFESSIONAL HISTORY

ENSR Consulting and Engineering
Ensotech, Inc.
Atlantic Richfield Company
Bethlehem Copper Corporation

EDUCATION

M.S. (Geological Science) University of Washington
B.S. (Geological Science) University of Washington
B.A. (English) University of Washington
(Hazardous Materials Management Courses) University of California, Los Angeles

PROFESSIONAL REGISTRATION AND AFFILIATIONS

Registered Geologist, California
Registered Water Well Inspector, Ventura County, California
National Water Well Association
National Association of Environmental Professionals

TECHNICAL SPECIALTIES

Mr. Anderson has 11 years of experience in:

- Site Assessment and Characterization
- Soil and Groundwater Remediation
- Workplan Design and Project Management
- CERCLA RI/FS and RCRA FI/CMS Process
- Technical Management of Underground Storage Tank (UST) Removal Projects and Leak Detection Investigations (LDI)
- Geological and Geophysical Mapping and Interpretation
- QA/QC of Analytical Data
- Regulatory Agency Negotiations

REPRESENTATIVE PROJECT EXPERIENCE

- Naval Facilities Engineering Command, Western Division - Contamination Verification. Project geologist for site investigations, including design and implementation of soil and groundwater sampling program and design of drilling and well installation program at the Marine Corps Air Ground Combat Center in Twentynine Palms, California. Project was conducted as part of the Naval Assessment and Control of Installation Pollutants (NACIP) Program.

REPRESENTATIVE PROJECT EXPERIENCE (Continued)

- Naval Facilities Engineering Command, Western Division - Remedial Investigation. Project geologist/hydrogeologist for remedial investigations of sites identified in the Preliminary Assessment/Site Investigation (PA/SI) as potential threats to human health or the environment.
- Texaco, Inc. - US EPA California Superfund Site - RI/FS. Project manager and technical lead for Remedial Investigation/Feasibility Study (RI/FS) activities of sole PRP. Tasks to date include technical support for submittal of "good faith offer" to conduct RI/FS, and preparation of RI/FS Workplan, Site Background Summary Report, and Sampling and Analysis Plan. Activities include hydrogeologic, subsurface soil, soil gas, surface water and stream sediment, surface soil and air investigations.
- Marine Corps Air-Ground Combat Center - SWAT. Project geologist/hydrogeologist for water quality Solid Waste Assessment Test (SWAT) of active solid waste disposal site. The SWAT was conducted on a canyon landfill which contained unexploded ordnance. Project included the installation of Teflon lysimeters and seismic refraction mapping of subsurface. Conducted field trip to site as part of California Regional Water Quality Control Board Quarterly Meeting. Provided certification for report.
- Marine Corps Air Ground Combat Center - HAR. Project geologist/hydrogeologist for Hydrogeological Assessment Report (HAR) of Crash Fire Rescue Training Pit (Burn Pit). Prepared workplan, supervised investigation of vadose zone, groundwater, and evaluation of climatological data. Provided certification for report.
- Confidential Client - Environmental Liability Assessment. Project manager for environmental compliance assessment and site evaluation of 13 facilities of a major manufacturing company. The purpose of the project was to identify and cost out any current or potentially significant environmental problems including regulatory noncompliance and onsite/offsite environmental liabilities. The review was conducted in strict confidentiality with only key individuals aware of the project purpose. Plants and facilities in seven states and Mexico were assessed.

REPRESENTATIVE PROJECT EXPERIENCE (Continued)

- Luz International Corporation - Siting Study. Participated in the initial screening of eight sites to support a Notice of Intent (NOI) to proceed with the Authorization for Certification (AFC) process for a 400-Mw solar power plant. Selection criteria included seismic activity, hydrology, hydrogeology, geology, topography, and land availability.
- Confidential Client (Lending Institution) - Site Characterization and Remediation. Managed site characterization and remediation of Southern California property formerly used for the manufacture of pesticides and fumigants. Designed and managed extensive drilling program, trench sampling, and installation of groundwater treatment system. Assisted in successful NPDES permit application. High level of contamination required Class B protection for most characterization work. Represented client in negotiations with regulatory agencies.
- Confidential Client - US EPA California Superfund Site - Soil and Groundwater Sampling and Analysis. Represented owner/PRP in all soil and groundwater sampling programs and data analysis work for a central California site. Project emphasized the minimization of costs and potential liability of the owner/PRP.
- Exxon Company USA - US EPA California Superfund Site - ROD Analysis. Managed the analysis of the Record of Decision (ROD) cost estimate to identify inaccuracies and verify cost estimates at an EPA Superfund Site in Southern California.
- Chemical Waste Management, Inc. - RFI Plan. Managed preparation of RCRA Facility Investigation (RFI) workplan for closure of truck wash at a hazardous waste transportation, storage, and disposal facility in California. Closure procedures include demolition, excavation, and removal of debris; excavation of contaminated soil; clean verification; and backfilling and compaction.

REPRESENTATIVE PROJECT EXPERIENCE (Continued)

- Confidential Client (Insurance Company) - Low-Level Radioactive Waste. Managed the production of a cost estimate for the cleanup of a Southern California laboratory contaminated with low-level radioactive waste and hazardous waste. Emphasis was on the allocation of cleanup costs between the two types of wastes.
- Sunland Refining Corporation - Site Characterization and Remediation. Project Manager for site characterization and remediation of a central California refinery with significant soil and groundwater contamination. Used continuous coring, soil vapor analysis, and results of laboratory analysis to determine migration paths, velocity and vertical and lateral extent of contaminants in the vadose zone, as a floating phase on the water table, and dissolved in the groundwater. Designed and implemented Interim Remedial Measures.
- Underground Storage Tank (UST) Management. Project hydrogeologist and manager of more than 40 UST projects. Supervised UST removal, site characterization, delineation and excavation of contaminated soil, permitting of chemical and biological remediation, verification sampling, backfilling and compaction of soil, installation of groundwater monitoring and recovery wells, and permitting of discharge of treated groundwater.
- Drilling and Associated Experience. Drilling experience includes air and mud rotary, hollow-stem auger, bucket auger, continuous flite auger, dual wall reverse air percussion hammer, and cable tool. Logging experience includes mud and lithologic logs, continuous coring, side wall cores, and split-spoon sampling. Borehole geophysical logging and log analysis experience includes electrical/nuclear/gamma ray and other logs.

JOHN H. AWEEKA

PROFESSIONAL HISTORY

ENSR Consulting and Engineering
COMAP Geosurveys, Inc.
Conoco Exploration of Egypt
Getty Oil Company
Fairfield Industries, Inc.
Conoco Exploration and Production, Inc.

EDUCATION

B.A. (Geological Sciences) University of California, Santa Barbara
B.A. (Geography) University of California, Santa Barbara

TECHNICAL SPECIALTIES

Mr. Aweeka has 8 years of experience in:

- Project Management
- Site Geologic Assessment and Characterization Studies
- Surface, Subsurface, and Marine Geological and Geophysical Data Acquisition and Interpretation
- Atmospheric Dispersion Modeling: Air Quality Impact and Health Risk Assessments of Criteria Pollutant and Toxic Contaminant Sources
- Environmental Liability Assessments

REPRESENTATIVE PROJECT EXPERIENCE

- CalMat Company - Environmental Characterization of Impoundment and Underground Storage Tank (UST) Sites. Managed site geologic assessments and characterizations involving soil gas surveys, soil borings, and installation of monitoring wells at a site in Saticoy, California. Designed groundwater investigation workplan for County agencies. Delineated volume of contaminated impoundment material and prepared recommendations for site remediation.

REPRESENTATIVE PROJECT EXPERIENCE (Continued)

- Texaco Refining and Marketing, Inc. - Pacific Coast Pipelines Site. Conducted site geologic assessment and characterized contaminant sources and their respective impacts to soil and groundwater at a proposed state Superfund site in Fillmore, California. Directed the assimilation of a number of environmental studies into one document.
- Guam Oil & Refining Company - Characterization of Subsurface Soil and Groundwater. Investigated the extent of hydrocarbon contamination at the GORCO tank farm on the U.S. Territory of Guam. Operations included the acquisition of soil gas data and subsurface geologic information through mud rotary drilling.
- Naval Facilities Engineering Command, Western Division - Marine Corps Air Ground Combat Center (MCAGCC), Twentynine Palms. Site geologist for this Naval Assessment and Control of Installation Pollutants (NACIP) Program. Conducted drilling and sampling of subsurface soils and groundwater and the acquisition of seismic refraction data for a Solid Waste Assessment Test (SWAT) of an active landfill and for a Hydrologic Assessment Report (HAR) of a fuel spill site.
- Public Storage and Associated Lending Institutions and Developers. Project manager for site assessments throughout the United States to determine the potential presence of significant contamination problems involving or affecting the sites. Reviewed historical site usage data; conducted preliminary environmental characterization of the site and surrounding land uses; reviewed the products made, processes used, raw materials employed, wastes generated; discussed affected regulatory issues; and recommended further analyses when necessary. Responsible for additional characterization work to investigate and delineate the extent of suspected environmental contamination.
- Hughes Aircraft Company - Radar Systems Group. Conducted a facilitywide survey to identify quantity and location of equipment or material containing polychlorinated biphenyls (PCBs). Reviewed facility blueprints to identify areas likely to contain PCBs including electrical substations, switchgear, motor control centers, and other locations where liquid-filled transformers or capacitors might be located.

REPRESENTATIVE PROJECT EXPERIENCE (Continued)

- Shell Western Exploration and Production, Inc. - Shallow Subsurface Engineering Hazard and Exploration Evaluations. Responsible for mobilization of geophysical survey vessel; supervised operations to acquire high-resolution marine geophysical data to resolve engineering hazards and exploration targets beneath the seafloor. Supervised the acquisition, interpretation, and reporting of data covering 49 offshore blocks within the Saint George and Navarin Basins in the Bering Sea.
- Drilling and Logging Experience. Supervised drilling operations involving hollow-stem auger, mud rotary, and dual wall air percussion rigs. Geophysical logging experience includes: electrical, nuclear, sonic, gamma-ray, dip, lithologic, and mud logs. Experience with conventional cores, split-spoon sampling, and gravity coring.
- Union Oil Company of Alaska. Marine geophysical assessment of conditions contributing to the Spring 1985 blowout at Platform Grayling, Cook Inlet, Alaska. Mobilized the geophysical survey vessel Lady Brigid to acquire high-resolution subsurface geophysical data to resolve cause of blowout. Responsible for data collection, interpretation, reporting, and client liaison.
- AMOCO Exploration of Africa - Shallow Subsurface Engineering Hazard Evaluations. Responsible for mobilization of geophysical survey vessel in West Africa. Supervised the collection of high-resolution marine geophysical and core data to resolve engineering hazards beneath the seafloor.
- Longview Fibre Company - PSD Permitting. Air quality and toxic emissions impact analyses in support of prevention of significant deterioration (PSD) permit application for proposed modification to the Longview Fibre Paper Mill. Conducted an air quality impact analysis to address PSD regulations. Investigation included modeling of criteria pollutant and chlorine impacts utilizing ISCST, Complex-I, and PTPLU.

REPRESENTATIVE PROJECT EXPERIENCE (Continued)

- Luz Engineering Corporation - Solar Power Plant Permitting. Air quality impact assessment of emissions associated with the construction and operation of several solar power plants in the Mojave Desert, California. Analyzed criteria pollutant impacts utilizing EPA-approved models ISCST, COMPLEX-I, and PLMSTAR. Conducted analyses in support of small power plant exemption (SPPE) regulations and authority to construct (ATC) permit applications.
- Ventura County Air Pollution Control District. Air quality impact analyses and risk assessment for the Simi Valley Landfill expansion in Southern California. Conducted dispersion modeling analyses of landfill emissions to determine the maximum impacts of criteria and toxic contaminants.
- California State Lands Commission. Air quality impact analysis for offshore state tidelands tract. Conducted air trajectory analyses of emissions from proposed offshore exploratory activities over Parcel 1 in the California Tidelands area.

JUNE ANDERSON

PROFESSIONAL HISTORY

ENSR Consulting and Engineering
Ensotech, Inc.
Atlantic Richfield Company
University of Washington

EDUCATION

M.S. (Geologic Science) University of Washington
B.S. (Geologic Science) University of Washington
(Hazardous Materials Management Courses) University of
California, Los Angeles

PROFESSIONAL AFFILIATIONS

National Association of Environmental Professionals

TECHNICAL SPECIALTIES

Ms. Anderson has 7 years of experience in:

- Hazardous Materials Project Management
- Regulatory Agency Negotiation
- Site Characterization, Soil and Groundwater Monitoring
- Surface and Subsurface Geological Mapping and Interpretation
- Subsurface Geophysical Interpretation
- Environmental Impact Evaluation and Assessment

REPRESENTATIVE PROJECT EXPERIENCE

- Confidential Client - Site Characterization and Closure for USTs Formerly Containing Solvents. Project manager for characterization and remediation of soil and groundwater. Managed regulatory interface, development of workplan, final reports, project costing, and supervised field activities and personnel.

REPRESENTATIVE PROJECT EXPERIENCE (Continued)

- Confidential Client - Pesticide Characterization and Remediation (California-Listed Extremely Hazardous Waste), Metals and Petroleum Hydrocarbon Contamination. Project manager for characterization and remediation workplans, field operations, and site remediation. Determined remedial options for contaminated soil and railroad boxcars. Developed contracts and procured subcontractors.
- Confidential Clients - California State Superfund Site. Project geologist, area characterization; stratigraphy, structure, and hydrogeology.
- Marine Corps Air-Ground Combat Center - Solid Waste Assessment Test (SWAT). Project geologist, water resources and data analysis and interpretation for solid waste assessment test report for a landfill.
- Marine Corps Air-Ground Combat Center - Hydrological Assessment Report (HAR). Project geologist, water resources and meteorological data analysis, and interpretation for hydrological assessment workplan and report for toxic burn pits.
- Confidential Client - EPA Superfund Site. Produced a cost analysis and report determining reasonable allocation of cleanup costs between radioactive waste and chemical hazardous waste at the site of a former laboratory in southern California.
- DOE Contractor - Radioactive Materials Evaluation. Conducted environmental and ecological study of microfloral populations concerning possible release of radioactive material.
- Confidential Client - EPA Superfund Site. Soil and groundwater sampling and analysis. Technical representative for lawyer and PRP during RI/FS, including soil and groundwater sampling and analysis.
- Various Clients - UST Management. Project manager for UST site characterizations; delineated soil and groundwater degradation, supervised excavation of soil, permitted chemical and biological remediation, supervised and performed verification sampling and supervised installation of groundwater monitoring and recovery wells.

REPRESENTATIVE PROJECT EXPERIENCE (Continued)

- Various Clients - Drilling. Experience includes hollow-stem auger, mud rotary and air rotary drilling. Logging experience includes electrical, nuclear, and geophysical logs; sidewall and conventional cores; and lithologic and mud logs; specialty, dip meter interpretation.
- Confidential Client - Subsurface Geologic and Economic Study. Managed a multidisciplinary team, including chemists, engineers, geophysicists, paleontologists, and geologists to produce a geologic history, and sedimentological and structural interpretation of a 50 billion cubic foot gas field. The study included an economic evaluation.
- Confidential Client - Property Evaluation. Managed geologists and geophysicists and participated as a geologist on a task force evaluating properties for their present and future economic potential.
- Various Clients - Surface and Subsurface Mapping. Map types include hydrogeological, structural (present and paleo), sedimentological, and environmental.
- University of Washington - Offshore Drilling Study. Performed environmental and taxonomic analyses of Deep Sea Drilling Program (DSDP) microflora.

ALICE ARMSTRONG

PROFESSIONAL HISTORY

ENSR Consulting and Engineering
Douglas Aircraft Company

EDUCATION

M.S (Occupational/Environmental Health and Safety) California
State University, Northridge
B.A (Environmental Biology) California State University
Northridge

PROFESSIONAL AFFILIATIONS

American Industrial Hygiene Association
National Environmental Health Association

TECHNICAL SPECIALTIES

Ms. Armstrong has 3 years of experience in:

- Occupational Health and Safety Program Management
- Environmental Risk Assessment, Health Effects, Sampling,
and Analysis
- Hazardous Waste Management

REPRESENTATIVE PROJECT EXPERIENCE

- Douglas Aircraft Company - Hazard Communication Program. Developed and coordinated company Hazard Communication Program in Long Beach, California. Responsible for chemical and operations inventory, course development and presentation, as well as ongoing program administration.
- Luz Engineering Corporation - Health and Safety Plan. Prepared Health and Safety Plans for solar electric generating system operation in Kramer Junction and Harper Lake, California. Programs included respiratory protection, hearing conservation, hazard communication, and hazardous waste management.
- Lansdale Semiconductor - Business Plan. Assisted in preparation of a business plan for a semiconductor manufacturer in Santa Monica, California, under Section 22500 of the California Health and Safety Code.

REPRESENTATIVE PROJECT EXPERIENCE (Continued)

- ARCO Petroleum Products Company - Training Handbook. Developed handbook outlining training guideline requirements for refinery operation.
- ARCO Petroleum Products Company - Health and Safety Plan. Reviewed and updated Health and Safety Plan used by ARCO Petroleum Products Company marketing distribution facilities throughout the United States.
- Santa Fe Energy Company - Site Characterization. Coordinated ongoing health and safety activities during site characterization of a closed 80-acre hazardous waste landfill in Taft, California. Responsible for ensuring proper use of personal protective equipment, including supplied air respirators, and conducting area and personnel monitoring.
- Naval Facilities Engineering Command, Western Division - Site Verification Study. Served as site health and safety officer for a verification study of nine sites at the Marine Corps Air Ground Combat Center, Twentynine Palms, California. Responsibilities included use of radiation detection instrumentation and hydrocarbon photoionization analyzer.
- ARCO Petroleum Products Company - Industrial Hygiene Surveys. Conducted industrial hygiene surveys of Marketing Distribution Terminals in Phoenix, Arizona and Richmond and Vinvale, California. Monitored noise and benzene, and interpreted results with reference to applicable standards.
- Southern Pacific Pipeline - Industrial Hygiene Surveys. Conducted benzene exposure studies at various facilities located throughout California.
- Rockwell International Science Center - Hazardous Materials Contingency Plan. Prepared plan incorporating federal and state regulations relevant to emergency response action and training requirements.

REPRESENTATIVE PROJECT EXPERIENCE (Continued)

- ENSR - Regional Health and Safety Manager. Managed in-house health and safety functions for field and laboratory personnel in ENSR's three California offices. Provided health and safety plans for all OSHA-regulated site field activities. Assisted in the development and implementation of 40-hour Hazardous Waste Operations training programs. Maintained personnel protective equipment inventory. Provided health and safety field oversight including conducting industrial hygiene related exposure requirements. Provided health and safety support for the Camarillo, California laboratory.

MICHAEL S. ASTIN

PROFESSIONAL HISTORY

ENSR Consulting and Engineering
Exxon Company, USA .
Exxon Production Research Company

EDUCATION

B.S. (Chemical Engineering) Brigham Young University

PROFESSIONAL REGISTRATION AND AFFILIATIONS

Registered P.E. (Chemical) California
Registered Environmental Assessor, California
American Institute of Chemical Engineers

TECHNICAL SPECIALTIES

Mr. Astin has 10 years of experience in:

- Project Management
- Project Engineering Design
- Waste Minimization
- Site Characterization
- Closure and Post-Closure Planning/RCRA Permitting

REPRESENTATIVE PROJECT EXPERIENCE

- Circuit Board Manufacturer - Waste Minimization and Wastewater Treatment. Managed the review of waste handling practices at three circuit board manufacturing facilities. Redesigned waste treatment facilities to minimize waste discharged.
- Texaco USA - Site Characterization. Managed the characterization of surface and subsurface soils and groundwater at a liquid petroleum gas (LPG) storage and loading facility in California. Work included soil gas surveys, soil borings, and monitoring well installation.

REPRESENTATIVE PROJECT EXPERIENCE (Continued)

- Luz International Corporation - Waste Characterization. Managed development of plan for sampling and analysis of waste for the purpose of waste characterization. Worked with state agencies to ensure plan was suitable to the state. Managed monitoring and analysis of bioremediation demonstration project for contaminated soils.
- Shell Guam, Inc./Guam Oil and Refining Company - Site Assessment. Managed an environmental site assessment for an oil refinery and tank farm in Guam. Work included analysis of regulatory compliance, as soil gas survey of the tank farm, soil borings, analysis of soil samples, and evaluation of site geology.
- Wickliff & Company - Feasibility Study/Remediation. Managed site assessment and characterization of site with subsurface contamination by volatile organics. Conducted feasibility analysis of various remedial alternatives. Managed remediation, including permitting, and successfully closed site.
- Environmental Protection Corporation - Closure/Post-Closure Planning. Managed development of Closure/Post-Closure Plans and Post-Closure Permit Application for a hazardous waste disposal facility in California. Performed feasibility analysis and design of remedial activities. Worked with EPC and government agencies on negotiating closure and post-closure procedures.
- Hillview-Porter - RI/FS Preparation. Prepared Feasibility study Workplan for a state Superfund site in Palo Alto, California.
- Chemical Waste Management, Inc. - RFI Plans. Managed preparation of RCRA Facility Investigation (RFI) workplans for a hazardous waste transportation, storage, and disposal facility in California.
- Santa Fe Energy Company - Closure/Post-Closure Planning. Participated in the development of Closure/Post-Closure Plans and the Post-Closure Permit Application for a hazardous waste disposal facility in California. Identified the waste inventory, analyzed applicable laws and regulations, and developed the Contingency Plan, security procedures, and facility inspection schedules. Worked with client to develop most appropriate remedial options.

REPRESENTATIVE PROJECT EXPERIENCE (Continued)

- Major Aerospace Company - PCB Survey. Managed a survey of PCB equipment for a major aerospace firm. Approximately 30 buildings were surveyed and PCB-contaminating equipment identified.
- Lending Institutions, Law Firms, and Developers - Environmental Assessments. Managed projects for lending institutions, law firms, and real estate concerns involving site assessments for potential liabilities related to regulatory compliance, hazardous material and waste management techniques, potential sources of toxic releases or ground contamination, and impacts from surrounding sources.
- Exxon Company USA - Environmental Audit. Managed the environmental audit for two oil production leases and related facilities in California. Work included developing audit checklists for future audits.
- Exxon Company USA - Process Simulation. Managed the development of an interactive computer model that simulates the operation of production and processing facilities for the purpose of process optimization. Reduced the cost for the project from an estimated \$10 million to less than \$1 million by incorporating existing software. Supervised the efforts of engineers and system analysts. The project was completed on time and under budget.
- Luz International Corporation - Certification for Solar Power Plant. Participated in development of Application for Certification for five solar power plants in San Bernardino County for Luz Engineering Corporation. Involvement included analyses of air quality, toxics, and hazardous waste.
- Exxon Company USA - Plant Design and Construction. Acted as management consultant in the design and construction of a natural gas processing plant in Santa Barbara County. Reviewed contractor design work, monitored project schedule and permitting, and conducted process optimization studies. Also worked on mitigation of archaeological finds during earthwork, reforestation, permitting of pipeline through the beach zone, and noise abatement.

REPRESENTATIVE PROJECT EXPERIENCE (Continued)

- Exxon Company USA - Conceptual Engineering. Managed conceptual engineering for development of an oil field in Alaska. Activities included definition, conceptual facility design, investment and operating cost analysis, environmental analysis, and permitting.
- Exxon Company USA - Environmental Analysis. Managed internal environmental analysis of a natural gas processing plant and options for expansion. Analyses included air emissions and impacts, product/waste disposal, and transportation impacts.
- Exxon Company USA - Environmental Analysis. Managed air emissions inventory for operations and support of offshore oil production facilities in Santa Barbara Channel, California. Managed the design and installation of a meteorological monitoring station on an offshore platform.
- Exxon Company USA - Regulatory Analysis. Served on an industry/agency task force on development of regulations regarding fugitive volatile organic compound emissions.
- Esso Malaysia - Safety Analysis. Managed a project to assess the potential impacts resulting from the catastrophic rupture of an LPG pipeline. Work included dispersion and transport analysis of flammable cloud. Designed safety shutdown system to protect against potential hazard.

JANICE G. BAKER

PROFESSIONAL HISTORY

ENSR Consulting and Engineering
Boston College

EDUCATION

Ph.D. (Biology and Experimental Statistics) New Mexico State University
M.S. (Biology) New Mexico Highlands University
B.A. (Zoology and Anthropology) Eastern New Mexico University

PROFESSIONAL REGISTRATIONS AND AFFILIATIONS

California Registered Environmental Assessor (REA-01032)
Certificate in Hazardous Materials Management

TECHNICAL SPECIALTIES

Dr. Baker has 15 years of experience in:

- Environmental Impact Assessments
- Permitting for New Construction
- Hazardous Wastes Investigations
- Project Management
- Expert Witness Testimony

REPRESENTATIVE PROJECT EXPERIENCE

- Naval Facilities Engineering Command, Western Division - Verification of Contamination. Managed study to investigate historical contamination from hazardous pollutants at nine sites at the Marine Corps Air Ground Combat Center, Twentynine Palms, California. Investigations included soil and groundwater sampling, chemical analyses, and evaluation of potential effects on the environment and human health. Studies conducted as part of the Naval Assessment and Control of Installation Pollutants (NACIP) program.

REPRESENTATIVE PROJECT EXPERIENCE (Continued)

- California Department of Transportation and U.S. Forest Service - Crude Oil Pipeline EIR/EIS. Managed preparation of an Environmental Impact Report (EIR) and Environmental Impact Statement (EIS) for the proposed Angeles Pipeline, a 30-inch-diameter, 135-mile-long pipeline from the Bakersfield area to the Los Angeles Basin. ENSR assessed direct and indirect impacts associated with construction and operation of the pipeline. Primary concerns were risk assessment and air quality impacts of refining the crude.
- Chevron USA - Cogeneration Facility SPPE. Managed the preparation of a Small Power Plant Exemption (SPPE) application to the California Energy Commission (CEC) for a proposed cogeneration facility at Chevron's Richmond, California refinery. The 99-MW facility is designed to meet the refinery's electrical needs.
- Luz Engineering Corporation - Solar Power Plant AFC. Managed the preparation of a 3,000-page Application for Certification (AFC) for submittal to the CEC. Five 30-MW solar-powered electric generating systems are being constructed in the Mojave Desert, 130 miles northeast of Los Angeles. Primary issues of concern were air quality impacts of backup boilers, endangered species, and toxicity of heat transfer fluid.
- Property Transfers. Conducted site assessments for a variety of clients throughout California for property transfer, acquisition, and divestiture. Legal liability for hazardous materials is imposed on past and present property owners by federal regulations. Brief assessments were designed to investigate the probability of a site problem as well as technical options for cleanup.
- Chevron USA - Cogeneration Facility - SPPE. Managed the preparation of an SPPE application to CEC for a proposed cogeneration facility at Chevron's El Segundo, California refinery. The cogeneration facility was proposed in order to comply with South Coast Air Quality Management District's Rule 1109 for reduction of NO_x emissions. The facility will replace the No. 1 Boiler House and provide steam for process use and for the generation of electric power.

REPRESENTATIVE PROJECT EXPERIENCE (Continued)

- City of Carpinteria - Gas Plant Modification EIR. Managed environmental studies designed to satisfy the California Environmental Quality Act requirements for an EIR. Chevron's Carpinteria, California gas plant needed to be modified in order to treat the high sulfur content gas to be produced at the proposed Platform Gail. The facility is designed to treat 36 million standard cubic feet of gas per day. Risk assessment studies were conducted.
- Burlington Northern Railroad Company - Railyard Expansion EIS. Managed the preparation of an EIS for a proposed expansion of the Vancouver, Washington railyard. Railyard to be expanded to allow long trains to be made up on a single track. EIS emphasized mitigation measures especially for noise and roadway impacts. The City of Vancouver was the lead agency.
- Union Camp Corporation - New Pulp and Paper Mill Analysis. Managed critical flaw and regulatory analyses for two potential mill sites in Alabama and South Carolina. Wrote major sections and directed the preparation of an Environmental Assessment submitted for a U.S. Army Corps of Engineers Section 10/404 permit. Also coordinated air quality and water quality modeling studies in support of Prevention of Significant Deterioration (PSD) and National Pollutant Discharge Elimination System (NPDES) applications for the selected site for a 2,250 ton-per-day (tpd) mill in South Carolina.
- Bureau of Land Management - Photointerpretation of Ecological Features. Managed photo interpretation of vegetation types, wildlife habitat, and other natural resource features of 5,600 square miles in western North Dakota and eastern Montana.
- St. Regis Paper Company - Paper Mill Expansion EIA. Managed preparation of an EIA for the addition of a new paper machine and ancillary facilities and for a second EIA for replacement of the ground wood mill with a thermomechanical pulp (TMP) mill. Also managed studies in support of PSD, NPDES, and solid waste permits. Pulp making capacity was increased from 140 tpd to 720 tpd and papermaking capacity from 240 tpd to 720 tpd at this Sartell, Minnesota mill.

REPRESENTATIVE PROJECT EXPERIENCE (Continued)

- Scott Paper Company - Mill Modernization Studies. Managed environmental studies for the modernization and expansion of a mill utilities complex and woodyard in Mobile, Alabama. Studies included a PSD application, environmental assessments for two Corps Section 10/404 permit applications, and onsite and offsite transportation analyses.
- Hydrological Information Services - Remote River Monitoring. Managed an ENSR new venture designed to remotely collect data on stream flow and reservoir volumes throughout the State of Colorado, transmit the data via satellite, receive and archive the data, and access the data through a computer via a telephone line anywhere in the United States. ENSR installed and operated monitoring stations, maintained the system, and developed software to monitor and predict hydrological events.
- Northern Tier Pipeline Company - Crude Oil Pipeline. Prepared a seven-volume site application submitted to the Washington Energy Facility Siting Council for a crude oil marine terminal, onshore storage facilities, and 933,000-barrel-per-day, 1,490-mile-long pipeline.
- U.S. Army Corps of Engineers - Hydroelectric Dam Ecological Studies. Designed and directed ecological studies for the proposed Dickey-Lincoln hydroelectric project on the St. John, Little Black, and Big Black Rivers and their major tributaries in Maine. Studies relied heavily on vegetation mapping from aerial photographs, field checking, and wildlife habitat evaluation.
- Boise Cascade - Mill Expansion EA. Supervised the preparation of a draft Environmental Assessment worksheet for a proposed kraft pulp and paper mill expansion in International Falls, Minnesota. Studies included air quality, water quality, noise, and land use issues.
- U.S. Army Corps of Engineers - Barge Canal Analysis. Managed aquatic ecological sampling and laboratory studies for a proposed 150-mile-long barge canal extending from Palatka, Florida to Yankeetown, Florida.

REPRESENTATIVE PROJECT EXPERIENCE (Continued)

- Union Camp Corporation - Mill Expansion EIA. Directed the preparation of an environmental impact assessment for the expansion of an unbleached kraft mill in Montgomery, Alabama from 1,200 to 2,200 tpd. Studies included air quality, water quality, socioeconomic, transportation, noise, land use, and community infrastructure.
- CONOCO - Copper Mine and Smelter Ecology Studies. Managed terrestrial ecology field and laboratory studies for a proposed 350,000 tpd copper mine and smelter. Analysis of potential impacts associated with six mining/processing/finishing alternatives for proposed copper development near Florence, Arizona.
- Mobil Oil Company - Refinery Expansion Ecology Studies. Managed terrestrial ecology studies for a proposed expansion at the Paulsboro, New Jersey refinery from 100,000 to 250,000 barrels per day.
- New England Energy Company - Proposed Refinery Ecology Investigations. Managed terrestrial ecology investigations on the proposed site for an oil refinery and pipeline near Sanford, Maine.

ROBERT H. CLEMENS

PROFESSIONAL HISTORY

ERT, Inc.
Alliance Technologies Corporation (formerly GCA)
U.S. Environmental Protection Agency
Great Lakes Basin Commission
- Fourteen years professional experience

EDUCATION

M.S. (Geology) University of South Carolina
B.S. (Geology) Allegheny College

AFFILIATIONS

National Water Well Association
Association of Ground Water Scientists and Engineers
American Institute of Professional Geologists
Society of Economic Paleontologists and Mineralogists
Association of Engineering Geologists, Northeast Section

PROFESSIONAL REGISTRATION

Certified Professional Geological Scientist (AIPG #6009)

TECHNICAL SPECIALTIES

- o Waste Site Program Management
- o Environmental Geology
- o Hydrogeology
- o Hazardous Waste Site Characterization
- o RCRA and CERCLA Regulatory Compliance and Site Investigations
- o Environmental Due Diligence

REPRESENTATIVE PROJECT EXPERIENCE

CERCLA/RCRA Compliance and Oversight

- o IBM. Project manager for a remedial investigation of a New York State Superfund site. Investigation components include geophysical site surveys in conjunction with test pitting, soil boring, and monitor well installation programs. Defining nature and extent of landfilled waste material and ground water contamination. Work conducted pursuant to an administrative consent order with New York and coordinated with the New York DEC.

- o Picillo Farms NPL Site. Project manager for an Alternate Concentration Limit (ACL) demonstration program designed to develop acceptable ground water standards for the off-site areas of the Picillo Superfund site in Rhode Island. Project included development of a soil boring and ground water monitor well installation program to address hydrogeologic data gaps from previous site investigations. Additionally, surface and ground water samples were collected and bioassays were conducted to determine toxicity levels of off-site surface water exposure locations. Data will be used for determining additional remedial actions that may be necessary on or off-site for protection of ground water.
- o Reilly Tar and Chemical Corporation. Project manager for Remedial Investigation/Feasibility Study RI/FS being conducted at an operating chemical company in Indiana pursuant to federal consent order. Project includes surface and ground water investigations for potential releases of creosote wastes and development of remedial alternatives. Project responsibilities include client and agency interaction, task design and implementation, project staff supervision and coordination, and budget and schedule tracking.
- o Stringfellow NPL Site. Technical and strategic review for PRP committee including consultation services concerning federal and state investigations at a Superfund site in southern California. Reviewed and commented on agency technical documents and provided research and analytical support to PRP group for consideration of technically feasible and cost-effective remedial alternatives.
- o Yaworski Lagoon Oversight. Technical staff support to PRP committee providing consultation and oversight services concerning remedial investigations being conducted at a Superfund site in Connecticut. Evaluated federal investigation and documents, reviewed study designs, and advised PRP group of impacts concerning investigation findings on remedial alternatives development.
- o Saco Tannery Waste Pits. As project manager for confidential client, providing consulting and oversight support for RI/FS being conducted by federal government at abandoned tannery waste pits in southern Maine. Reviewing technical documents developed during remedial investigations and participations in the development of remedial alternatives for the site.
- o Tibbets Road Site. Project manager with responsibilities for development of an RI/FS workplan subsequently submitted by the client to New Hampshire and federal regulatory agencies. Work plan included detailed surface and ground water hydrologic characterization components and additional on-site soils characterization following interim remedial measures conducted by U.S. EPA.

- o Solvents Recovery Services. Provided hydrogeologic support for development of a RCRA/CERCLA judicial consent decree for ground water investigation and cleanup at a solvent recycling facility in Connecticut. Reviewed ground water quality and quantity analytical results and developed on-site and off-site ground water recovery plans for restoration of the drinking water aquifer in the vicinity of the facility.
- o Valley Bumper Recycling. Project manager for site characterization and closure plan development for a RCRA interim status facility in Virginia. Project included collection of environmental samples from surface impoundments, tanks, soils and groundwater at a chrome plating facility, and development of closure and corrective action plans pursuant to federal and state RCRA requirements.

Waste Site Program Management

- o U.S. EPA. Hydrogeologist and Chief, Physical Sciences Section; Office of Waste Programs Enforcement. Responsible for technical oversight of EPA enforcement investigations at RCRA and CERCLA sites including reviews and revisions to agency and PRP investigative plans and reports. Represented EPA in technical negotiations with PRPs at over 20 NPL sites located in all EPA regions. Provided technical direction to development of CERCLA and RCRA guidance documents and participated in training and regional review programs to achieve nationally consistent approaches and procedures.
- o ERT. Senior Hydrogeologist and Manager, Geosciences Division. Responsible for staff assignments for waste site investigations and technical review of ERT reports. Responsible for coordinating hazardous waste management staff utilization with other ERT offices on a weekly basis to ensure effective and efficient application of ERT technical resources to waste site projects throughout the United States.

Environmental Due Diligence

- o Citicorp. Project manager for site evaluations of nine Georgia textile facilities and three Pennsylvania casting facilities in support of a major corporate refinancing effort. Mobilized and directed staff from several ERT offices to conduct facility inspections for potential environmental liabilities. Coordinated inspection program for all facilities, and developed and presented final report and recommendations. Work resulted in identification of several environmental problems which were subsequently addressed in the terms of the final credit agreement.

- o Westvaco. Coordinated investigations of timberland properties in South Carolina and West Virginia totalling almost 50,000 acres in order to address the "innocent landowner" provisions of SARA. Investigations included detailed review of aerial photographs and maps combined with field inspections to identify potential areas of hazardous waste release. Effort resulted in identification of areas for specific field testing, and exclusion of some areas of concern from eventual purchase agreement.
- o Sony. Conducted facility inspection of a record and cassette tape producing facility in Mexico City, Mexico. Inspection and subsequent report focused on storage and handling of hazardous materials, management and disposal of hazardous wastes, compliance with existing Mexican environmental statutes, and recommendations for improvements in facility operations consistent with United States facilities and requirements.
- o Worcester Automatic Heating. Project manager for site assessment of a fuel oil transfer facility. Project included installation of ground water monitoring wells, identification of oil product in the subsurface, subsequent underground storage tank testing, and tank and contaminated soil excavation. This project was conducted in close coordination with the state regulatory agency and resulted in acceptable remediation and clearance of the site for property transfer.
- o Real Estate Site Assessments. Program manager for over 100 site assessments in Massachusetts and New Hampshire designed to identify the presence of or potential for releases of oil or hazardous materials pursuant to state "super lien" regulations.

DONALD P. GALYA

PROFESSIONAL HISTORY

ENSR Consulting and Engineering
Stone & Webster Engineering Corporation
United Engineers & Constructors, Inc.
Consolidated Edison Company of New York, Inc.

EDUCATION

M.S. (Environmental Science/Water Chemistry) Rutgers University
B.S. (Physical Oceanography) Florida Institute of Technology

PROFESSIONAL AFFILIATIONS

American Society of Civil Engineers
Boston Society of Civil Engineers
American Geophysical Union
International Society for Ecological Modeling
National Water Well Association
New England Water Pollution Control Association
Water Pollution Control Federation

PROFESSIONAL REGISTRATION

Professional Engineer (Massachusetts)

TECHNICAL SPECIALTIES

- Modeling of physical dynamics, transport and water quality of surface and groundwater
- Hazardous waste investigations
- Water resources and hydrological studies
- Impact resources and hydrological studies
- Wave runup analyses

REPRESENTATIVE PROJECT EXPERIENCE

Transport Modeling

- Florida Power Corporation-Nuclear Power Plant, Water Quality Study. Task manager for water quality modeling of coastal area near power station. Used finite element hydrodynamic and dispersion models. Modified models to properly simulate the effect of oyster bars by using semi-permeable boundary formulation. Supervised field investigations of currents, water quality and temperature.

REPRESENTATIVE PROJECT EXPERIENCE (Continued)

- Confidential Client-Water Quality Study. Project manager for water quality study involving field data collection, data analysis, water quality modeling, Waste Load Allocation and permit development for facility on Pomperaug River, Connecticut.
- Confidential Client-Water Quality Modeling Study. Task Manager for project involving model development, calibration, and application for Waste Load Allocation and permit development for a facility on Fishkill Creek, New York.
- Tampa Electric Company-Power Plant Water Quality. Task manager for water quality modeling studies of power plant impacts. Used finite element hydrodynamic and dispersion models for far-field simulations of Tampa Bay.
- New York State Electric & Gas Siting Study. Performed analysis of environmental impacts due to thermal, chemical, and sanitary waste discharges. Performed analyses of transport and fate of toxic substances in Hudson River and Lake Ontario due to accidental releases.
- Consolidated Edison Company of New York, Inc.-Nuclear Power Plant Water Quality Studies. Applied quasi-three dimensional numerical model to determine water quality effects of power plant discharges.
- Duquesne Light Company-Nuclear Power Station River Modeling Study. Performed modeling study to determine transport and fate of toxic substances in Ohio River due to accidental releases.
- Niagara Mohawk Power Corporation-Nuclear Power Plant Lake Modeling Study. Performed modeling study to determine transport and fate of toxic substances in Lake Ontario due to accidental releases.

Hazardous Waste Studies

- McDermott, Will and Emery-PCB Hazardous Waste Investigation. Project Manager for Remedial Investigation/Feasibility Study of site involving PCB and VOC contamination of soils, groundwater, surface water, stream sediments, and building surfaces. Responsible for management of field investigations, data interpretation, hazard evaluation, risk assessment, and remedial action development and evaluation.

REPRESENTATIVE PROJECT EXPERIENCE (Continued)

- Confidential Client, Superfund Site. Task manager for project involving Superfund site consisting of a contaminated major river and associated estuarine and ocean areas. Project involved a literature review and development of a budget of contaminated material for the study area. Results of the study to be used in litigation.
- Confidential Client, Chromium Waste Site. Project Manager for remedial actions and agency negotiations for chromium waste disposal site.
- Generator Committee - ReSolve Superfund Site. Task Manager for review and technical critique of agency generated groundwater modeling for Feasibility Study. Independent modeling study performed which indicated major flaws in agency study.
- Patton, Boggs, and Blow-Tyson's Dump Superfund Site. Project Manager for project involving review of EPA Contractors' RI/FS and numerous related documents, and development of independent transport modeling studies, risk assessment, and allocation of site cleanup costs for a site at which a variety of organic and heavy metal wastes were disposed.
- Confidential Client, Wood Preserving Site. Task Manager for modeling studies to determine extent of groundwater and surface water contamination due to creosote and other organic compounds. Project also involved review and critique of hydrologic aspects of RI report performed for site.
- Confidential Client, Massachusetts Industrial Park. Project Manager for environmental site assessment of large industrial park consisting of various types of facilities including several manufacturing operations.
- Confidential Client, Fossil Power Plant. Project Manager for environmental site assessment of fossil-fueled power plant in operation since approximately 1900. The assessment revealed potential problems due to PCBs from transformers, an onsite waste disposal lagoon, asbestos on boilers and piping, underground storage tanks, and several oil spills.
- A. J. Ross Company, New Jersey. Project Manager for environmental site assessment of steel fabrication and warehousing facility.

REPRESENTATIVE PROJECT EXPERIENCE (Continued)

- Foamex, Inc. Performed environmental site assessments of polyurethane foam manufacturing facilities in Rhode Island, Tennessee, and Florida.
- Kyanize Paint Company-Environmental Site Assessment. Project manager for site assessment involving evaluation of potential for hazardous waste contamination of site and company compliance with environmental regulations.
- Confidential Client - Industriplex Superfund Site. Reviewed and provided technical critique of hydrological aspects of RI/FS for site. Developed alternative hydrology related remedial action plan to remedy deficiencies in original RI/FS plan.

Groundwater Modeling

- American Petroleum Institute, Nationwide Waste Pit Study. Task Manager for groundwater modeling study to determine risks associated with disposal of drilling muds in waste pits. Unsaturated and saturated zone were modeled using computer program developed for the study. Modeling included deterministic simulations of 20 representative sites and Monte Carlo simulations to determine nationwide risk. A variety of organics or inorganic contaminants were modeled.
- Virginia Electric and Power Company - Nuclear Power Plant Groundwater Transport Modeling Study, Virginia. Task manager for groundwater transport and dispersion analysis to determine the fate of radionuclides due to postulated accidental spills of radioactive material.
- American Telephone & Telegraph Hazardous Waste Site Groundwater Modeling Study. Performed groundwater modeling and designed drainage system to remove VOC contaminated groundwater.
- American Petroleum Institute - Groundwater Model Development Study. Performed technical analysis and provided comments on groundwater model proposed by U.S. EPA for delisting evaluations. Developed an alternative model more appropriate and realistic for delisting applications. Comments and model development documented in technical report submitted to U.S. EPA.

REPRESENTATIVE PROJECT EXPERIENCE (Continued)

- Confidential Client - Tetraethyl Lead Manufacturing Facility. Task manager for groundwater modeling study to determine fate and transport of lead in contaminated soil and groundwater at tetraethyl lead manufacturing facility in Texas.
- AMAX Corp. and Brown Foundation, Brown Wood Superfund Site, Florida. Task manager for groundwater modeling study to determine fate and transport of various organic compounds due to leaching from a surface lagoon.
- Patton, Boggs & Blow Exclusion Petition Modeling Study. Project manager for groundwater modeling study to determine transport of perchloroethylene from stream-stripped dry-cleaning cartridge filters. Developed technical report on modeling study which was submitted to U.S. EPA as part of exclusion petition.

Hydrologic Studies

- Virginia Electric and Power Company Hydroelectric Dam Hydrological Analysis and Flood Study. Task manager for backwater analyses of Roanoke river downstream of Gaston and Roanoke Rapids Dams. Results used for dam safety study.
- Office of Nuclear Waste Isolation, Radioactive Waste Disposal Site. Determined preliminary hydrology related impacts due to deep well boring program at potential radioactive waste disposal sites.
- U. S. Department of Energy, Synthetic Fuel Plant Hydrological Study, Maine. Task manager for hydrologic aspects of proposed synthetic fuel plant. Process would involve harvesting and burning of peat. Analysis included consideration of hydrologic aspects of peat harvesting and impacts due to harvesting and plant operation.

Reservoir Modeling

- City of Klamath Falls, Oregon-Hydroelectric Power Ecosystem Modeling Study. Task manager for water quality/ecosystem modeling effort to determine environmental effects of proposed dam. Simulated operation of dam under various river flows and operational schemes in order to determine impacts on cold water fishery.

REPRESENTATIVE PROJECT EXPERIENCE (Continued)

- Philadelphia Electric Company-Hydroelectric Power Project Ecosystem Modeling Study. Task manager for water quality/ecosystem modeling effort to determine effects of various release schemes on environmental parameters.
- Allegheny Power Company-Hydroelectric Power Project Design Study. Performed preliminary modeling studies to determine water intake levels for proposed power project.

Environmental Impact Studies

- Eastern Kentucky Power Corporation-Environmental Impact Study. Discipline Manager for all hydrologic and water quality studies for Environmental Impact Statement. Evaluated potential plant sites, developed field data collection programs and performed impact analyses. Surface water impacts due to plant operation and groundwater impacts due to coal pile runoff were considered. Developed basic design for plant reservoir.
- Signal Environmental Systems, Resource Recovery Facility, New Jersey. Task manager for all hydrology and water quality studies, water-related reports and permits necessary for licensing resource recovery facility with once through cooling system.

DAVID L. GERRY

PROFESSIONAL HISTORY

ENSR Consulting and Engineering
Converse Environmental Consultants
General Atlantic Energy Corporation
Mobil Oil Corporation

EDUCATION

Doctor Studies (Hydrogeology) Colorado School of Mines
M.S. (Engineering Geology) Colorado State University
B.A. (Geology) University of California, Riverside
(Hazardous Waste Management) University of California,
Los Angeles

PROFESSIONAL REGISTRATION AND AFFILIATIONS

Registered Geologist, California #4256
Association of Engineering Geologists
Association of Groundwater Scientists and Engineers
American Association of Petroleum Geologists, Certified
Petroleum Geologist #3254

TECHNICAL SPECIALTIES

- Hydrogeologic and Geologic Characterizations
- Groundwater Monitoring and Sampling
- Soil and Groundwater Remediation
- Underground Storage Tank Investigation and Remedial Action

REPRESENTATIVE PROJECT EXPERIENCE

- Hillview-Porter California Superfund - RI/FS Preparation.
Technical lead in preparation of RI/FS Workplan addressing groundwater contamination caused by spills of industrial solvents. Project involves site characterization, well installation and monitoring, aquifer assessment, groundwater modeling, and remediation.

REPRESENTATIVE PROJECT EXPERIENCE (Continued)

- Riverside County Landfill - Solid Waste Assessment Test (SWAT) Preparation. Coordinated field work and subsequent report preparation of SWAT for three operating landfills. Characterization involved installation of groundwater and vadose zone monitoring equipment, and sampling of soils, groundwater, and vadose zone vapor.
- Aerospace Industry Client - Proposition 65 Assessment. Managed the assessment of industrial compliance wastewater in relation to California's Proposition 65 Discharge Prohibition for a large, multidivision, multifacility aerospace corporation.
- Southern California Rapid Transit District - Contaminant Characterization. Managed the characterization of soils and groundwater at seven large bus maintenance and fueling facilities. Coordinated with state and local agencies for the preparation and implementation of appropriate remedial workplans.
- City of Pasadena - Liability Assessments. Managed projects involving site assessments for liabilities related to potential soil or groundwater contamination. Managed subsequent characterization and remediation plans.
- Shaklee Corporation - Remediation Workplan. Managed preparation and implementation of a workplan for characterization and remediation of hazardous materials in soil and buildings.
- Chevron USA, Inc. - Contaminated Remediation. Managed the characterization and remediation of contaminated soil and groundwater at numerous retail fueling facilities. Implemented ongoing groundwater monitoring plans and "pump and treat" remedial actions.
- Pacific Bell - Underground Storage Tank Remediation. Managed the characterization and remediation of hazardous materials in soil and groundwater at more than 50 sites, in relation to a project bringing underground storage tanks into compliance with state and local regulations.

REPRESENTATIVE PROJECT EXPERIENCE (Continued)

- Chevron USA, Inc. - Hazardous Materials Remediation. Managed the characterization of hazardous materials in soils at a fuel dispensing facility and managed the preparation of a soil vapor extraction system for remediation of soil contamination.
- Safety Kleen - Remedial Workplan. Managed the characterization of hazardous materials in soil and groundwater at chemical recycling facilities. Coordinated with local agencies in preparing and implementing a remedial workplan which included a groundwater pump and treatment system.
- General Atlantic Energy - Exploration and Development. Managed numerous exploration and development drilling projects in areas throughout the United States.
- Mobil Oil Corporation - Drilling Operations. Managed drilling operations for more than 50 separate projects in the Rock Mountains and west coast divisions.
- Chevron USA, Inc. - Underground Storage Tank (UST) Remediation. Managed characterization, monitoring, and any required remediation associated with UST compliance or removals.

SAMUEL L. NOTT

PROFESSIONAL HISTORY

ERT, A Resource Engineering Company, 1985 to Present
U.S. Environmental Protection Agency, 1972 to 1985
U.S. Army, 1970 to 1972
U.S. Army Corps of Engineers, 1969 to 1970

EDUCATION

M.S. (Bioenvironmental Engineering) Oklahoma State University
B.S. (Chemical Engineering) Oklahoma State University

AFFILIATIONS

American Society of Civil Engineers
Air Pollution Control Association

PROFESSIONAL REGISTRATION

P.E. (Environmental Engineering) Texas

TECHNICAL SPECIALTIES

- Hazardous Waste Management
- Waste Disposal Site Evaluation and Closure Plans
- Regulatory Interpretation and Agency Liaison
- Project and Program Management

REPRESENTATIVE PROJECT EXPERIENCE

- U.S. EPA - Remedial Investigation/Feasibility Study (RI/FS). Management of RI/FS conducted by State and EPA contractors pursuant to the National Contingency Plan. Experience with Superfund work at over 45 sites on the NPL.
- U.S. EPA - PRP Groups. Regulatory and Policy direction to groups of Potentially Responsible Parties subject to CERCLA actions. Lead EPA representative at large PRP and steering committee meetings.
- U.S. EPA - Wood Treating Facilities Investigation. Management responsibility for RI/FS activities for wood treating facilities in Arkansas and Texas.
- U.S. EPA - Dallas Lead Contamination. EPA project manager for negotiation of the remedial activities including management of implementation plan.

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PROFESSIONAL HISTORY

ERT, A Resource Engineering Company, 1985 to Present
U.S. Environmental Protection Agency, 1972 to 1985
U.S. Army, 1970 to 1972
U.S. Army Corps of Engineers, 1969 to 1970

EDUCATION

M.S. (Bioenvironmental Engineering) Oklahoma State University
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PROFESSIONAL REGISTRATION

P.E. (Environmental Engineering) Texas

TECHNICAL SPECIALTIES

- Hazardous Waste Management
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- U.S. EPA - Dallas Lead Contamination. EPA project manager for negotiation of the remedial activities including management of implementation plan.

SAMUEL L. NOTT

REPRESENTATIVE PROJECT EXPERIENCE (continued)

- Remedial Action Plans. Project manager for large aircraft manufacturing facility to investigate and develop multiple waste disposal areas and develop remedial action plans for source control and groundwater remediation. Contaminants ranged from heavy metals to solvents to jet fuel.
- U.S. EPA - Petro Processors Negotiations. EPA project manager responsible for conducting technical negotiations. Encompasses complex geologic setting, state-of-the-art closure, and multi-party settlement.
- U.S. EPA Manager. Responsible for overall management of the Superfund program for EPA Region VI encompassing five southwestern states. Provided technical and policy expertise in remedy selection.
- Superfund Enforcement. Responsible for all EPA interface with industry on Superfund program. Timely, effective negotiations and settlements.
- Site Evaluations. Managed systematic evaluation of over 2,000 potential uncontrolled hazardous waste sites including technical review to determine if further action needed.
- Water Quality. Responsible for establishing water quality standards and appropriate effluent limits. All phases of water quality planning under the Clear Water Act.
- State/Federal Liaison. Coordination with all levels of state and federal government through 16 years of federal service.
- Underground Storage Tanks. Project manager for the assessment of underground storage tanks at 457 service stations to identify potential leaking tanks.
- Regulatory Exposure Assessment. Project manager for inspection and evaluation of regulatory implications of closing a polystyrene plant for a confidential client.
- Law Firm - Property Transfer. Project manager for inspecting a facility in anticipation of property transfer. Involved subsurface solvent contamination.

SAMUEL L. NOTT

REPRESENTATIVE PROJECT EXPERIENCE (continued)

- Remedial Action Plans. Project manager for large aircraft manufacturing facility to investigate and develop multiple waste disposal areas and develop remedial action plans for source control and groundwater remediation. Contaminants ranged from heavy metals to solvents to jet fuel.
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- Regulatory Exposure Assessment. Project manager for inspection and evaluation of regulatory implications of closing a polystyrene plant for a confidential client.
- Law Firm - Property Transfer. Project manager for inspecting a facility in anticipation of property transfer. Involved subsurface solvent contamination.

WILLIAM E. RAUCH

PROFESSIONAL HISTORY

ENSR Consulting and Engineering
Los Angeles Unified School District

EDUCATION

M.S. (Geology) Western Washington University
B.S. (Earth Science) University of California, Santa Cruz
(Hazardous Materials Management Courses) University of
California, Los Angeles

TECHNICAL SPECIALTIES

Mr. Rauch has 1 year of experience in:

- Environmental Compliance Audits
- Environmental Liability Assessments and Audits
- Geologic Site Characterization
- Hydrogeologic Site Investigations Involving Drilling, Supervision of Soil Borings, Sampling, Installation of Groundwater Monitoring Wells, and Assessments

REPRESENTATIVE PROJECT EXPERIENCE

- Confidential Aerospace Company - Proposition 65 Assessment. Participated in assessment of risk of water discharge violations in relation to California's Proposition 65 Discharge Prohibition for a large, multidivision, multifacility aerospace corporation.
- Confidential Aerospace Company - Proposition 65 Assessment. Participated in site assessment and sampling program for compliance with California's Proposition 65 Discharge Prohibition.
- Greyhound Lines - Site Assessments. Conducted environmental audits for several Greyhound bus terminals in California, including site investigation, agency research, and asbestos sampling. Made recommendations regarding the need for further investigative activities and potential remediation.

REPRESENTATIVE PROJECT EXPERIENCE (Continued)

- Whittaker Corporation - Compliance Audit. Conducted environmental compliance audit for electronic parts manufacturing firm. Made recommendations regarding the need for further investigative activities and potential remediation.
- LaSalle Partners - Subsurface Investigation. Project Manager and geologist for a subsurface investigation of a major commercial property. Coordinated workplan and managed field crew for soil borings and installation of groundwater monitoring wells. Included extensive multi-party interaction and negotiations.
- Southern Pacific Transportation Company - Subsurface Investigation. Project Manager and geologist for a subsurface investigation involving diesel fuel and pesticide contamination. Managed field crew and coordinated final written report.
- Public Storage - Site Assessments. Conducted several site investigations, agency research, and asbestos sampling. Supervised drilling operations and soil borings and installation of groundwater monitoring wells for environmental liability assessments throughout California and Illinois.
- Akzo Coatings - Soil and Groundwater Contamination. Participated in the coordination of investigation of soil contamination due to leaking underground tanks. Conducted soil sampling and developed the site health and safety plan. Site geologist and manager for the installation of groundwater monitoring well and characterization.
- Marine Corps Air Ground Combat Center - Contamination Investigation. Participated in a soil gas investigation and groundwater characterization in Twentynine Palms, California through aquifer testing for military installation with significant soil and groundwater contamination.
- Sunland Oil Refinery - Contamination Investigation. Site Geologist and Assistant Project Manager for site characterization of a central California refinery with significant soil and groundwater contamination.

WILLIAM E. RAUCH

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REPRESENTATIVE PROJECT EXPERIENCE (Continued)

- Grubb and Ellis Commercial Brokerage - Contamination Investigation. Coordinated program for soil borings and monitoring well installation for site with potential soil and groundwater contamination in Ventura, California.
- Confidential Client - Soil Remediation. Participated in sampling program related to site characterization and remediation efforts for soil with diesel and gasoline contamination.
- Westrec Properties - Site Assessment. Conducted site investigation, agency research, and asbestos sampling for environmental liabilities assessment.
- Indicator Controls Corporation - Site Assessment. Conducted site investigation and agency research in Los Angeles, California, for environmental liabilities assessment.

GREGORY RUMFORD

PROFESSIONAL HISTORY

ENSR Consulting and Engineering
Naval Energy and Environmental Support Activity

EDUCATION

B.S. (Civil Engineering) University of Missouri
Continuing Education (Landfill Design and Construction) EPA

PROFESSIONAL REGISTRATION AND AFFILIATIONS

P.E. (Civil) California
American Society of Civil Engineers
Association of Groundwater Scientists and Engineers

TECHNICAL SPECIALTIES

Mr. Rumford has 5 years of experience in:

- Remedial Investigations/Feasibility Studies
- Oil and Hazardous Substance Spill Prevention, Control and Countermeasures Plans
- Underground Storage Tank Management
- Site Investigations and Assessment

REPRESENTATIVE PROJECT EXPERIENCE

- Marine Corps Air Ground Combat Center - RI/FS. Designed and managed RI/FS at ten sites including landfills, burnpits, pesticide spray area, transformer spill area, and diesel spill area. Prepared and implemented workplans and QA/QC plans. Coordinated with regulatory agencies, supervised field personnel, and directed subcontractors.
- U.S. Navy - Hydrogeological Assessment Report. Managed investigation of toxic pits. Determined vadose zone and groundwater sampling rationale. Supervised collection and evaluation of climatological data, and performed hydrogeological tests to determine the potential of pollutant migration.

REPRESENTATIVE PROJECT EXPERIENCE (Continued)

- U.S. Navy - Water and Air Solid Waste Assessment Tests. Managed investigation of canyon landfill containing hazardous and explosive materials. Determined vadose zone and groundwater sampling rationale. Supervised installation of lysimeters and collection of geological data.
- Talley Corporation - Environmental Permitting of Aircraft Component Manufacturer. Identified pertinent federal, state, and local regulations related to clients' operations. Assembled data and supervised completion of air emission and sewer permits. Coordinated communication with regulatory agencies.
- Property Transfers - Confidential Textile Manufacturer and Confidential Industrial Machine Manufacturer. Conducted site investigation, record searches, and communication with regulatory agencies. Determined potential liability associated with neighboring federal NPL site, asbestos brake manufacturing, former coal gasification site, and improperly abandoned underground storage tanks.
- Naval Facilities Headquarters - SPCC Manual. Developed *Oil Spill Prevention, Control, and Countermeasures Planning Guidance Manual* for Navy installations worldwide. This manual provides comprehensive technical and policy guidance in preparing SPCC plans.
- Marine Corps Mountain Warfare Training Center - SPCC Plan. Developed SPCC Plan and underground storage tank management plan for this facility in California. Designed spill control structures, identified monitoring techniques and well locations, and determined cost-effective UST replacement.
- Puget Sound Naval Shipyard - Best Management Practices Plan. Managed development of Best Management Plan to minimize substance releases for the entire shipyard and specific plans for each dry dock and the hazardous waste storage facility. Identified facility design and operational deficiencies and corrective actions.

REPRESENTATIVE PROJECT EXPERIENCE (Continued)

- Marine Corps Air Station and Construction Battalion Center - Contingency Plans. Developed oil and hazardous substances spill contingency plan for sites in Hawaii and California. Identified areas of high spill risk and determined necessary response equipment and organization.
- Naval Facilities Headquarters - Potable Water Distribution System. Supervised computer modeling of water distribution system. Performed field tests to determine system parameters, including friction coefficients, flow rate, and true pipe diameter. Developed *Potable Water Leak Detection Manual* for use Navy-wide.

RICHARD A. SIMON

PROFESSIONAL HISTORY

ENSR Consulting and Engineering
California Department of Transportation

EDUCATION

B.A. (Urban Studies) California State University Northridge

TECHNICAL SPECIALTIES

Mr. Simon has 11 years of experience in:

- Management of Multidisciplinary Environmental Impact Analysis
- Public and Interagency Project Coordination
- Transportation Planning and Evaluation of Transportation Alternatives
- Environmental Liability Assessment
- Public and Interagency Project Coordination

REPRESENTATIVE PROJECT EXPERIENCE

- Solar Electric Generating System, Application For Certification at Harper Lake, California. Project manager for the preparation of an Application for Certification for the Luz Engineering Corporation proposal to site, construct, and operate an 80-MW solar power plant in the Mojave Desert. The document required by the California Energy Commission includes the need for the facility, project design, and associated environmental impacts.
- Environmental Liability Assessments. Project manager for several site assessments throughout the United States for various clients to determine the potential presence of the significant contamination problem involving or affecting the sites. The studies include the description, history, and environmental characterization of the site and surrounding land uses, a review of the products made, processes used, raw materials employed and wastes generated, a discussion of affected regulatory issues, and recommendations for further analysis.

REPRESENTATIVE PROJECT EXPERIENCE (Continued)

- Solar Electric Generating System, Application for Certification at Harper Lake, California. Project Manager for the preparation and presentation of studies required for the siting of 160-MW solar power plants in the Mojave Desert. The critical issues involved with the project include impacts to threatened and endangered species, air quality, and socioeconomic effects of the construction work force.
- Angeles Pipeline EIR/EIS. Environmental coordinator responsible for CEQA/NEPA processes, contract administration, press and public contact, planning and coordination of public meetings, and representation of the Lead Agency at meetings. The project involved the Southern California Pipeline System application for a crude oil pipeline from southern Kern County to Los Angeles Basin refineries. The EIR/EIS for the project included the evaluation of the direct effects of construction, operation, and abandonment of the pipeline, as well as of the indirect effects of refining offshore California and San Joaquin Valley crudes in the South Coast Air Basin.
- EIR/EIS for Route 2 (Santa Monica Boulevard) Improvements in the Cities of Los Angeles, Beverly Hills, and West Hollywood. Environmental planner and primary author responsible for the preparation and processing of the EIR/EIS. In addition to document preparation, the activities included scheduling and obtaining the deliverables from the multidisciplinary team, and coordination with local and federal agencies. This EIR/EIS included a comparison of transportation alternatives and their associated environmental impacts within a densely developed portion of Metropolitan Los Angeles.
- Howard Hughes Center. Environmental reviewer and coordinator for a joint land use and transportation project which required both an EIR and IS/EA. An environmental coordinator for this project managed interaction between local agency, developer, and engineering and environmental consultants to keep project on schedule and to ensure compliance with State and Federal laws and regulations. The project consisted of 2.7 million square feet of office/hotel development along with many transportation improvements including a new interchange along an interstate highway (Route 405).

REPRESENTATIVE PROJECT EXPERIENCE (Continued)

- Route 126 EIR/EIS for Highway Widening in Ventura and Los Angeles Counties. Environmental planner and primary author responsible for the preparation and processing of the EIR/EIS. Environmental representative to Ventura County and citizens advisory committees established to improve the safety and operational characteristics of the highway. The environmental issues associated with the project were public safety, floodplain encroachment, loss of prime agricultural lands, and growth inducement.
- Route 118 (Simi Valley Freeway) Supplemental EIR/EIS for Freeway Construction in the San Fernando Valley. Environmental planner and primary author responsible for the Supplemental EIR/EIS. Also performed construction monitoring to ensure the contractors use of environmentally permitted disposal sites. The Supplemental EIR/EIS was required to evaluate the impacts of mobile emissions and noise to elementary school children, and to identify disposal sites with the capacity for large amounts of excavated materials.
- Southeast Economic Development Area/Greenwood Avenue Interchange EIR/EA in the City of Monterey Park. Document reviewer and primary agency environmental contact assigned to oversee compliance of State and Federal laws and regulations. The project consisted of a General Plan Amendment for a 45-acre site and freeway interchange. Site evaluations determined the presence of hazardous materials and required the development of a removal plan in conjunction with the land owner/developer; City, State, and County Health Departments; and South Coast Air Quality Management District.
- Ventura Freeway (Route 101) Widening IS/EA from Thousand Oaks to Oxnard in Ventura County. Assistant environmental planner and primary document writer. Served as a member of the multidisciplinary team responsible for the land use and socioeconomic portions of the IS/EA. The areas of concern associated with the project were growth inducement and resultant loss of prime agricultural lands, impact upon archaeological resources, and protection of a locally historic grove of trees.

ADDITIONAL ENVIRONMENTAL STUDIES

- Pacific Coast Highway (Route 1) Widening IS/EA in Los Angeles County
- Long Beach Freeway (Route 710) Freeway Construction EIR/EIS in Los Angeles County
- Rio Rancho Interchange IS-EA Along Route 71 in Los Angeles County
- Campus Drive Interchange IS/EA Along the San Bernardino Freeway (Route 10) in Los Angeles County
- Ventura Freeway (Route 101) Operational Study EIR/EIS Between the San Diego Freeway and the City of Oxnard
- Route 126 Widening IS/EA in Ventura County
- San Diego/Marina Freeways (Routes 405/90) Interchange Connectors IS/EA in the City of Los Angeles

AMY G. TAKETOMO

PROFESSIONAL HISTORY

ENSR Consulting and Engineering
J. Paul Getty Trust
Analytichem International, Inc.

EDUCATION

M.S. (Chemistry) University of California, Riverside
B.S. (Chemistry) University of California, Irvine

PROFESSIONAL REGISTRATION AND AFFILIATIONS

Air Pollution Control Association
American Chemical Society

TECHNICAL SPECIALTIES

Ms. Taketomo has 10 years of experience in:

- Ambient Air Quality Studies
- Analytical Chemical Analysis
- Environmental Sample Analysis
- Trace Element Analysis

REPRESENTATIVE PROJECT EXPERIENCE

- Montana State University - Chlorinated Fluorocarbon Research. Principal investigator setting up a GC laboratory and initiating research program for indoor levels of chlorinated fluorocarbons.
- J. Paul Getty Museum - Air Quality Evaluations. Deputy manager for a 12-museum survey to develop an indoor air quality evaluation program to analyze for organic acids, aldehydes, and ketones.
- Kaiser Aluminum - Air Quality Analysis. Task manager providing analysis of particulate carbon, chlorine, and ions present in air samples.

REPRESENTATIVE PROJECT EXPERIENCE (Continued)

- AeroVironment, Inc. - Carbonaceous Species Analysis. Program manager for analysis of AV samples for carbonaceous species in aerosols for the Subregional Cooperative Electric Power Research Institute, National Park Service, Environmental Protection Agency, Department of Defense Study (SCENES).
- Coordinating Research Council - Carbonaceous Aerosol Speciation. Program manager for laboratory support for the speciation of carbonaceous aerosol in foil samples from uniform deposition impactors.
- Salt River Project (SRP) - Carbonaceous Species Analysis. Program manager providing sample analysis for client for carbonaceous species in aerosols for the Subregional Cooperative Electric Power Research Institute, National Park Service, Environmental Protection Agency, Department of Defense Study (SCENES) at SRP sites.
- Desert Research Institute (DRI) Carbonaceous Species Analysis. Program manager providing sample analysis for carbonaceous species in aerosols for the Subregional Cooperative Electric Power Research Protection Agency, Department of Defense Study (SCENES) from SCE-sponsored sites or monitoring stations.
- Coordinating Research Council - Carbonaceous Species Analysis. Program manager providing filters and analysis of carbonaceous species air aerosol samples and formaldehyde plus eight other carbonyls in ambient air samples, collected during the Southern California Air Quality Study (SCAQS) summer and winter intensive monitoring projects.
- Desert Research Institute (DRI) - Acid Deposition Monitoring. Program manager providing filters and analysis of dry acid deposition samples for the California Acid Deposition Monitoring Program (CADMP).
- Black and Veatch - Air Quality Analysis. Task manager providing analysis of impinger and whole-air samples for aldehydes, ketones, esters, and sulfur gases.

AMY G. TAKETOMO

Page 3

REPRESENTATIVE PROJECT EXPERIENCE (Continued)

- Miscellaneous Clients - Air Quality Analyses. Analytical laboratory manager providing analysis of landfill gas samples, source samples, and ambient air samples for particulates, anions, cations, carbonyls, carbon species, hydrocarbons, VOCs, and air toxics.

MAURICE D. VEATCH
R.G., C.E.G., P.H.

PROFESSIONAL HISTORY

ENSR, Chief Hydrogeologist
Rockwell International, Chief Scientist
Shannon and Wilson, Principal-Geoscience and Waste Management
Division
Atlantic Richfield Company, Staff Hydrologist
Nebraska Geological Survey, Principal Hydrogeologist
Humble Oil and Refining Company, Exploration Geologist
Kerr-McGee Oil Industries, Development Geologist
Dale Veatch & Son Water Well Drilling, Partner

EDUCATION

Ph.D. (Geology and Hydrogeology) Stanford University
M.S. (Geology) Kansas State University
B.S. (Geology) Kansas State University

AFFILIATIONS

Geological Society of America, Hydrogeology Division
American Geophysical Union, Hydrology Section
Association of Ground Water Scientists and Engineers, a Division of
NWWA
American Water Resources Association
Association of Engineering Geologists
Society of Mining Engineers of AIME

PROFESSIONAL REGISTRATIONS

Registered Geologist, California and Oregon
Certified Engineering Geologist, Oregon
Professional Hydrogeologist, AIH

TECHNICAL SPECIALTIES

- Hydrogeology and Engineering Geology
- RCRA FI/CMS and CERCLA RI/FS Process
- Groundwater Remediation/Aquifer Restoration
- Groundwater Resource Development and Management
- Subsurface Radioactive Waste Disposal
- Project Management
- Expert Testimony

REPRESENTATIVE PROJECT EXPERIENCE

- Subsurface Hydrocarbon Recovery Plan - La Grande, Oregon. Evaluated regional and site-specific geologic and hydrogeologic data and the past history of diesel fuel losses to the ground. Evaluated existing monitoring well data to define the configuration of the oil plume floating on the groundwater. Estimated oil in place and developed a conceptual oil recovery system. Formulated oil recovery plan to address the State of Oregon, Department of Environmental Quality (DEQ) concerns. The plan was approved by the DEQ.
- Subsurface Recovery System - La Grande, Oregon. Obtained subsurface design confirmation data to facilitate final design and field design implementation of a major subsurface diesel oil recovery system. Hydrocarbon monitoring wells and recovery wells were designed, installed, tested, and put into operation. Post construction monitoring was provided to evaluate and demonstrate system effectiveness. Owner personnel were trained for on-site operation, maintenance, and environmental monitoring.
- Olympic Pipeline Company - Allen Station Oil Spill Cleanup and Aquifer Restoration. Developed and directed implementation of an emergency plan to prevent spread of oil plume in a shallow aquifer. Field designed interceptor trench and pumping system and obtained State-Department of Ecology approval to install design. Directed installation of design by pipeline company personnel and contractors. Monitored results of cleanup, pumping and decommissioned system upon completion of cleanup.
- Kaufman Brothers Diesel Spill Cleanup. Developed and implemented hydrogeologic assessment plan to characterize nature of the diesel spill and impact on a shallow underlying water table. Developed remedial system to recover and treat contaminated groundwater. Obtained State Department of Ecology approval to construct. Provided construction management consultation and provide system performance monitoring and documentation.
- CERCLA RI/FS Investigations - Various Sites. Technical overview consultant to project managers and staff of site characterization activities (geologic, hydrogeologic, soil sampling, and groundwater sampling). Provided technical review and input on CERCLA RI/FS reports and technical interface with PRP and EPA technical representatives.

REPRESENTATIVE PROJECT EXPERIENCE (Continued)

- Expert Testimony - Geology/Hydrology/Construction Dewatering. Provided expert assessments and testimony for a number of lawyers on geologic hazards, groundwater quality degradation, and construction impacts on groundwater supplies and related ground stability problems.
- Hydrogeologic Investigations. Principal investigator and/or project manager on over 100 groundwater assessment and/or development projects. Presented numerous groundwater-related papers to multidisciplinary audiences. Broad knowledge of geologic and hydrogeologic conditions throughout the United States. Considerable management and technical experience in the geologic, geophysical, hydrologic, and geotechnical engineering aspects of remedial investigations and feasibility studies for groundwater extraction and aquifer restoration from inception through post construction monitoring. Significant depth of knowledge and hands-on experience to multidisciplinary staffed and managed projects.
- CBI Offshore Company - Dewatering Assessment. Developed and implemented hydrogeologic investigation plant to assess the impact on groundwater quality of a proposed large graving drydock. Evaluated several different dewatering concept. Provided conceptual design and preliminary cost estimates. Technical interface with state and federal agencies as the client's representative.
- Des Moines Sewer District - Site Stabilization Dewatering System. Developed site characterization plan to determine the source of spring seepage discharge at the only site available for construction of a new sewage treatment plant. Determined source of spring discharge and developed a complex conceptual solution to stabilize the site soils; eliminate the surficial spring discharge; provide for construction dewatering and artesian pressure relief; and provide a permanent dewatering/depressurization system needed for periodic maintenance work on critical operating facilities. Assisted in obtaining EPA approval of conceptual solution. Developed definitive design, specifications, engineer's cost estimate, and pre-qualified contractors. Construction management contractor for design implementation. Prepared system operation manuals and directed training of plant personnel to operate the system. Completed system won engineering excellence design award from Consulting Engineers Council of Washington.
- Washington State Department of Fishiers - Stasop Springs Site. Developed a plan to determine the groundwater supply potential

REPRESENTATIVE PROJECT EXPERIENCE (Continued)

of the spring site. Directed implementation of the plan and identified methods to capture the spring discharge. Developed conceptual design for interceptor trends, a gallery system, and a shallow dewatering system with preliminary cost estimates. Developed definitive design for interceptor trench system and prepared bid package specifications for use by State of Washington.

- Washington State Department of Transportation - Snoqualmie River Diversion Dam. Identified feasible methods to eliminate spring seepage discharge on down stream face of earth fill, river diversion dam. Developed conceptual design for interceptor trench, system of dewatering wells, and slurry trench cutoff wall. Directed site investigation to confirm conceptual design assumptions and developed definitive design and engineer's cost estimate. Provided construction management consultation during remediation design implementation when slurry trench cutoff wall was installed.
- Washington Public Power Supply System - WPPSS Nuclear Site Construction Dewatering. Developed an emergency response plan to remediate foundation soil disturbance resulting from charge groundwater conditions encountered during construction. Field directed implementation of the plan which consisted of pumping tests, design and installation of dewatering wells, removal of disturbed soil, and removal of dewatering system. Remediation work was approved by U.S. Nuclear Regulatory Commission and allowed construction to proceed.
- City of Seattle - Cedar Falls Embankment Seepage Control. Developed and directed an extensive hydrogeologic assessment of large volume spring discharge from a large embankment adjacent to a major recreational lake. Identified the source of the spring discharge water and developed a conceptual solution to introduce the groundwater level in the source area to essentially eliminate the spring discharge. This solution resolved the slope stability and water quality impact problem to the lake being caused by the spring discharge.

BRANDON B. VINEYARD

PROFESSIONAL HISTORY

ENSR Consulting and Engineering
COMARCO, Inc.

EDUCATION

M.S.L. (Environmental Law) Vermont Law School
B.A. (Business Administration and Non-profit Management)
California Lutheran University
Certificate in Environmental Auditing (University of
California, Irvine), In process

PROFESSIONAL AFFILIATIONS

Association of Environmental Professionals

TECHNICAL SPECIALTIES

- Property Transfer Site Assessments
- Environmental Auditing
- Hazardous Material and Waste Management Plans
- Regulatory Research and Documentation
- Community Development Planning
- SARA Title III Assistance

REPRESENTATIVE PROJECT EXPERIENCE

- Luz Development and Finance Corporation - Hazardous Waste Generation and Transportation Plan. Prepared a detailed management plan for a solar power plant located in the Mojave Desert. Provided the specific federal, state, and local requirements for the hazardous wastes generated at the facility.
- Confidential Client - Air Quality Compliance Audit. Performed an in-depth air quality audit using Southern California Air Quality Management District regulations as guidelines. Three large aerospace facilities located within the Los Angeles basin were audited. Prepared applicable checklists and audit summaries.

REPRESENTATIVE PROJECT EXPERIENCE

- Naval Facilities Engineering Command Western Division - RI/FS. Researched applicable and appropriate laws and regulations concerning specific hazardous substances found in the soil at the site. Prepared the portion of the report which documents the action levels and cleanup levels required for the substances and applicable testing information.
- Public Storage, Inc. - Property Transfer Site Assessment. Performed and managed environmental site assessments in Illinois, Florida, Indiana, Michigan, New Jersey, and California. Reviewed environmental permits and applicable local and state regulations concerning the activities at the facilities. Assessed the potential for soil and groundwater contamination by reviewing hazardous material and waste storage techniques, use of underground storage tanks, historical land uses at the site, and surrounding past and current activities.
- Confidential Client - Property Transfer Environmental Audit. Performed a site investigation at a cogeneration power plant in northern California. Researched the environmental history of the site related to hazardous material and potential contamination.
- Hopper, Inc. - Property Transfer Site Assessment. Performed and managed an environmental site assessment at a 14-acre steel fabrication facility located in California. Reviewed the numerous processes onsite and the related hazardous materials and waste streams. Identified areas of potential contamination as related to underground fuel storage tanks and hazardous waste storage areas. Reviewed historical land uses.
- Public Storage, Inc. - Industrial Wastewater Compliance Review. Reviewed the processes of a newspaper company located in northern California. Provided recommendations concerning their obtaining an industrial wastewater permit from the local agency. Also provided the required application and related instructions.

REPRESENTATIVE PROJECT EXPERIENCE (Continued)

- Southern California Gas Company - Hazardous Waste Profile. Prepared profiles for the company's 59 hazardous waste streams. The profiles contain DOT, California, and federal waste information used for external and internal hazardous waste reports. Assisted in preparing recommendations concerning the proper handling, manifesting, and disposal of hazardous waste.
- Powerine Oil Co. - Regulatory Analysis/Tank Monitoring. Prepared a report which presented regulatory requirements for the client's underground storage of hazardous waste. Reviewed both state and local requirements concerning the classification of a waste as either hazardous or non-hazardous, storage of hazardous wastes in underground storage tanks, and applicable monitoring and leak detection requirements. Presented the client's alternatives to have waste declassified and tanks exempted from monitoring requirements or to obtain a variance.
- Confidential Client - SARA Title III Emergency Business Plan. Developed a required business plan for an explosives manufacturing and distribution facility. Performed a complete facility environmental records search. Applied all relevant federal, state, and local regulations to the hazardous materials and waste activities at the facility. Determined the classification of both hazardous materials and wastes.
- Confidential Client - Spill Reporting and Cleanup Regulatory Research. Researched the requirements of 13 states for spill/leak reporting and cleanup standards (remediation techniques and tank removal) concerning underground fuel tanks at petroleum distribution facilities. Assisted in the preparation of an extensive document which sets out these requirements for over 30 states.
- Confidential Client - OSHA Benzene Sampling Study. Assisted in the management of benzene sampling project. Performed all client liaison work.

REPRESENTATIVE PROJECT EXPERIENCE (Continued)

- Industrial Bank of Japan - Property Transfer Environmental Audit. Member of an auditing team that performed an extensive 2-day assessment of a two-site catalyst manufacturing facility. Evaluated the facility's environmental records and applied federal, state, and local regulations to the activities performed at the facilities. Reviewed all related environmental permits and associated liabilities and performed a historical land use review.
- August Financial Corporation - Property Transfer Site Assessment. Performed a site investigation at a retirement complex in Florida. Conducted a historical land use review. Reviewed government records concerning past and current regulated activities performed onsite.
- Tramell Crow - Property Transfer Site Assessment. Performed a site investigation at a wood paneling manufacturer in La Mirada, California. Reviewed environmental permits and applicable local and state regulations concerning the activities at the facility. Assessed the potential for soil and groundwater contamination by reviewing their hazardous material and waste storage techniques, use of underground storage tanks, historical land uses at the site, and surrounding past and current industries.
- California Federal Syndications - Property Transfer Site Assessment. Performed site investigations at two shopping centers, one in Pleasanton and the other in Santa Ana, California. Researched the historical land uses of the site and investigated the activities of each occupant to determine potential hazardous material releases.
- Security Pacific - Property Transfer Seminar. Prepared a draft 29-page Industrial Survey Checklist for Security Pacific to use in training their personnel for in-house property transfer investigations.
- Westinghouse Credit Corporation - Property Transfer Site Assessment. Performed a site investigation at three hotels, two in the San Francisco Bay Area and one in Phoenix, Arizona. Evaluated the potential for soil and groundwater contamination beneath each of the three hotels. Researched the historical land uses and reviewed the activities which could present an environmental risk at each site.

REPRESENTATIVE PROJECT EXPERIENCE (Continued)

- Property Transfer Site Assessment - Microsemi Corporation. Performed a site investigation at two semiconductor (chip) production facilities in the city of San Diego. Reviewed the facility's hazardous materials and waste handling activities and investigated the potential onsite and offsite soil, groundwater, and surface water contamination. Reviewed the historical land uses of the site.
- NCH Corporation - Property Transfer Site Assessment. Performed a site investigation at an unimproved 6-acre parcel located in an agricultural portion of Northern San Diego County. Research the historical land uses of the site and the surrounding area. Reviewed the potential of offsite contamination resulting from surrounding light industrial and agricultural activities.
- Confidential Client - Property Transfer Site Assessment. Performed site investigations at 10 separate sites in four western states and in 7 cities. Some of the sites investigated included a 70-unit commercial complex, an open-air shopping center, and a 125-unit motor inn. Researched the historical land uses at each site and reviewed activities performed both on and offsite to determine the potential environmental risks.
- Coast Connections - SARA Title III Tier I and II Reporting. Assisted the client in determining the applicability of SARA Title III Tier I and II reporting requirements to 12 facilities located across the country. Determined the applicability of the OSHA MSDS, employee training, and reporting requirements. Prepared several letters that the client used in contacting the appropriate agencies.
- Hyatt Development Corporation - Property Transfer Site Assessment. Performed a site investigation at the Hyatt Regency Hotel, Long Beach. Investigated the potential for onsite contamination from underground storage tanks at the hotel and from those in the immediate area. Researched the historical land uses of the site and the surrounding area.

REPRESENTATIVE PROJECT EXPERIENCE (Continued)

- Barclays Bank of California - Property Transfer Site Assessment. Performed a site investigation at a large machine shop in Orange County, California. Reviewed applicable regulatory incident files concerning the past activities performed at the site. Researched the historical land uses. Investigated the potential for onsite soil and groundwater contamination as a result of activities performed at the machine shop and from the surrounding area.
- Westwood Savings - Property Transfer Site Assessment. Performed a site investigation at a multi-building corporate headquarters and warehousing facility in Santa Fe Springs, California. Performed an in-depth review of the site's past historical land uses. Researched the potential for contamination from underground fuel storage tanks located onsite and reviewed the buildings for possible asbestos-containing material.
- AT&T Credit Corporation - Property Transfer Site Assessment. Performed a due diligence investigation at a multi-building aerospace/corporate plaza in El Segundo, California. Researched the past historical land uses of the site and investigated the extent of onsite remediation required as a result of leaking underground fuel storage tanks.
- Confidential Client - Property Transfer Site Assessment. Performed due diligence investigations at two large manufacturing facilities in West Lebanon, New Hampshire, and Huntsville, Alabama. Investigated the extent of remediation required for known contamination at both sites. Reviewed the facilities' environmental compliance programs and performed historical land use research.
- The William Lyon Company - Property Transfer Site Assessment. Performed a due diligence investigation at a corporate headquarters facility in Newport Beach, California. Researched the past historical land uses and investigated the potential for onsite contamination from offsite sources. Reviewed the compliance status of the underground fuel storage tank onsite.

REPRESENTATIVE PROJECT EXPERIENCE (Continued)

- Fullmer Company - Property Transfer Site Assessment. Performed an abbreviated due diligence study of a vacant 6-acre parcel of land in Ontario, California. The abbreviated assessment included a site visit and limited regulatory contact.
- China Lake Naval Weapon Center - Defense Project Scheduling. Prepared and interpreted logistical diagrams used in planning and scheduling efforts for the Cruise Missile Contact Fuze Device project. Organized the communicated information through schedules, reports, and earn-value charts facilitated by MicroSoft Chart and Program Management System software. Presented information to lead project engineers.